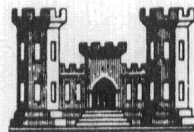
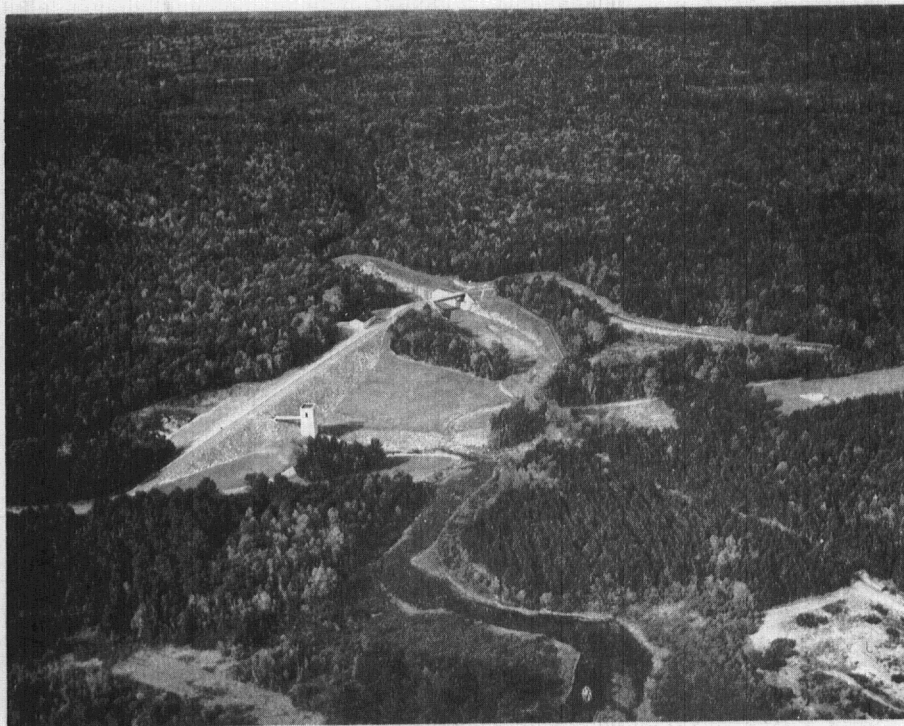


ERS

BARRE FALLS DAM

BARRE, MASSACHUSETTS

OPERATION AND MAINTENANCE MANUAL



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

TC423
.N43B317
1972

JUNE 1972

OPERATION AND MAINTENANCE MANUAL

FOR

BARRE FALLS DAM, MASSACHUSETTS

JUNE 1972

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 Trapelo Road
Waltham, Massachusetts 02154

139 99027 ✓

TABLE OF CONTENTS

PART I - GENERAL

	<u>Page No.</u>
Chapter 1 - Introduction	
a. Authority	I-1
b. Purpose	I-1
c. Parts of Manual	I-1
d. Scope of Manual	I-1
Chapter 2 - Project Description	
a. Authorization and Location	I-1
b. Brief Description of Project	I-1
c. History	I-4
d. List of Project Contracts	I-5

PART II - OPERATION AND MAINTENANCE

Chapter 1 - General	
a. Scope	II-1
b. Maintenance	II-1
c. Safety	II-1
d. Regulation Procedures	II-1
e. Supervisory Responsibilities	II-1
f. Leave	II-2
g. Public Relations	II-2
h. Real Estate Outgrant Administration	II-3
i. Summary of Service Duties	II-3
j. Reports	II-4
k. Recommended List of Spare Parts and Firefighting Equipment	II-5
l. Listing of Drawings	II-7
m. Equipment and Drawing Files	II-12
Chapter 2 - Dam and Dikes	
a. Slopes and Gutters	II-13
b. Interceptor Pipe Drains	II-14
c. Omitted	II-14
d. Inspection During Floods	II-14

Chapter 3 - Intake and Outlet Works, Retaining Walls, Spillway
and Buildings

a. Concrete and Masonry and Exterior Surfaces - General	II-16
b. Retaining Walls	II-17
c. Trash Racks	II-17
d. Log Booms	II-17
e. Tile and Staff Gages	II-17
f. Buildings	II-17
g. Bridges	II-19

Chapter 4 - Utilities

a. Water Supply and Sewer Systems	II-20
b. Heating and Ventilating	II-21
c. Telephone and Radio Equipment - Dam	II-22
d. Mount Wachusett Relay Station	II-22

Chapter 5 - Roads, Grounds and Recreation Areas

a. Roads, Parking Areas, Trails and Walks	II-23
b. Traffic Services and Signs	II-24
c. Drainage	II-24
d. Guard Rails and Fences	II-24
e. Grounds	II-25
f. Sanitary Facilities	II-26
g. Picnic Facilities	II-26
h. Refuse Collection	II-26
i. Insect and Rodent Control	II-27
j. Omitted	II-27
k. State of Massachusetts Division of Fisheries & Game	II-27
l. Snow Removal	II-27
m. Removal of Dead and Down Timber	II-27
n. Cutting of Wood by Others	II-27

Chapter 6 - Electrical and Mechanical Equipment

a. Gates	II-28
b. Generators and Motors	II-28
c. Electrical Equipment	II-29
d. Sumps and Sump Pumps	II-32

Chapter 7 - Fire Prevention

a. General	II-33
b. Extinguishers	II-33
c. Testing Extinguishers	II-34
d. Fire Hose	II-34
e. Nozzles and Playpipes	II-34
f. Fire Doors	II-34
g. Flammable Waste Containers	II-34
h. Fire Warning Signs	II-35
i. Fire Plan and Emergency Instructions	II-35
j. Fire Water Storage Tanks	II-35

Chapter 8 - Environmental Protection

a. Scope	II-36
b. Regulations	II-36
c. Air Pollution	II-36
d. Water Pollution	II-36
e. Land Despoilment	II-36
f. Noise Pollution	II-37

Chapter 9 - Miscellaneous

a. Mobile Equipment, Tools, etc.	II-38
b. Motor Vehicle Maintenance	II-38
c. Maintenance Records	II-39
d. Snow Shoes	II-40
e. Oil Storage Tanks	II-40

Inclosed Drawings

<u>Title</u>	<u>File No.</u>	<u>Sheet No.</u>
General Plan	CT-1-3074	2
Dam, Detail Plan	CT-1-3075	3
Dam, Embankment #1	CT-1-3076	4
Dike No. 1, Plan	CT-1-3078	6
Dike No. 2, Plan	CT-1-3079	7
Dike Embankment	CT-1-3081	9
Spillway Plan	CT-1-3086	14
Outlet Works Plan	CT-1-3093	21
Gatehouse Plan	CT-1-3109	37
Utility Building Plan	CT-1-3127	55
Operator's Quarters	CT-1-3134	62

OPERATION AND MAINTENANCE MANUAL

PART I - GENERAL

CHAPTER 1 - INTRODUCTION

a. Authority: Project Operation Manual Regulation ER-1130-2-304 and Appendix I dated 25 March 1966.

b. Purpose: The purpose of the manual is to provide guidance and instruction to the project personnel for the proper operation and maintenance of the project facilities.

c. Parts of Manual:

Part I - General

Part II - Operation and Maintenance

d. Scope of Manual: The scope of the manual is limited to the operation and maintenance instructions to the operating personnel for the proper upkeep, repair, maintenance and operation of the project facilities.

CHAPTER 2 - PROJECT DESCRIPTION:

a. Authorization and Location: The Barre Falls Dam project was authorized by the Flood Control Act approved 18 August 1941 (Public Law 228, 77th Congress) and 22 December 1944 (Public Law 534, 78th Congress) as a component part of the comprehensive system of reservoirs and channel improvements for flood control in the Connecticut River Basin.

The dam is located on the Ware River about 31.9 miles above its confluence with the Swift River, both tributaries of the Chicopee River, in the towns of Barre, Hubbardston and Rutland, Worcester County, Massachusetts.

b. Brief Description of Project: (1) The dam is rolled earth type with a dumped rock blanket on upstream face. It has a top length of 885 feet, a top width of 25 feet, top elevation of 830 feet m.s.l., and a maximum height of 70 feet. There are also three earth dikes 11,000 feet south of dam having a respective length of 720, 1475 and 1020 feet and a respective maximum height of 23, 38 and 48 feet. Spillway is in river channel and is concrete, ogee type with a crest length of 60 feet. Outlet works consist of a 9'-8' horseshoe conduit 250 feet in length and controlled by two 4 foot, 6-inch by 9 foot slide gates motor operated. Reservoir is operated for flood control purposes and has a storage capacity of 24,300 acre-feet which is equivalent to 8.0 inches of runoff from its drainage of 57 square miles. Pertinent Data follows:

PERTINENT DATA

RIVER BASIN: Connecticut
PROJECT NAME: Barre Falls Dam
RIVER: Ware River
LOCATION: Town of Barre, Worcester
County, Massachusetts

DRAINAGE AREA SQ. MILES: 55

RESERVOIR

No Permanent Pool

FLOOD CONTROL STORAGE

Capacity - Acre Feet	24,300
- Inches of Runoff	8.0
Area at Crest - Acres	1,400
Length - Miles	4

DAM

Type	Rolled rock fill & upstream impervious fill blanket.
Length - feet	885
Top elev. ft. - m.s.l.	830
Height above river bed	69
DIKES - Number, Total length	Three - 3,215

SPILLWAY

Type	Concrete Gravity
Length - feet	Ogee Weir
Elev. - m.s.l.	60
Distance below to top of Dam - feet	807
	23

CONTROL WORKS

Type	9'-8" dia. Horseshoe Conduit
Size - feet	9'- 8" diameter
Length - feet	250
Invert elev. - m.s.l.	761
Gates - Type	Sluice
Number	2
Size	4'-6"x9'-0"

TOTAL QUANTITIES

Embankment Volume - c.y.

454,200

Concrete - c.y.

5,800

TOTAL COST

\$2,150,159

OPERATIONAL

July 1958

PROJECT AREA - (Acres)

2,970

RECREATIONAL FACILITIES

2 picnic tables, fireplace,
parking area, sanitary
facilities, drinking water
supply.

Managed by:

CofE & Central Wildlife
District Manager, The
Commonwealth of Massachusetts
Division Fisheries and
Game

NO. OF PERMANENT EMPLOYEES:

4

RADIO CALL SIGN:

WUA-38

NO. OF GOV'T QUARTERS:

1

RIVER STAGE CHECKPOINT

Staff gage upstream
of Ware River Intake
Structure at Coldbrook.

Indian Orchard,
Chicopee, Mass.

(2) Mount Wachusett Relay Station

(a) The project includes the Water Quality Laboratory and Mount Wachusett Relay Station for maintenance purposes. The station consists of one building with three rooms, one with radio equipment, one with emergency generator, and one with METS equipment and related antenna and supports.

(b) The Wachusett Relay Station was built in 1957 (Ref. Dwg. No. CT-9-1209, -10, &-11) Antenne System modified in 1960 (Ref. Dwg. No. CT-9-1212. The Motorola Environmental Telemetry System (METS) equipment was installed in 1969 under Contract No. DACW33-68-F-0339 (AF34-601-23068). The lease has a term of 60 months extending through August 1974 including maintenance. Corps of Engineers personnel will be trained in the spring of 1974 for preventative maintenance and trouble shooting for the MET system. A 10Kw gas engine-generator was replaced by a 20Kw diesel engine-generator unit in 1972 and a new antenna installed.

(3) The Water Quality Laboratory is also located at Barre Falls Dam. The operation and maintenance of these facilities is the responsibility of the Water Quality Branch.

c. History.

<u>PROJECT</u>	<u>DATE</u>	<u>AMOUNT</u>
Definite Project Report	1948	\$ 119,000
Analysis of Design	1951	60,000
Plans and Specs	1956	
General Design Memo	1956	55,000
Engineering and Design	1956-58	26,000
Supervision and Administration	1956-58	157,000
Lands and Damages	1956	4,700
Electrical Service	1956	10,000
Relocations, Roads	1956	27,000
Reservoir	1956-58	66,000
Dam, Dikes and Misc.	1956-58	1,091,530
Roads	1956-58	115,000
Gate House	1956-58	39,000
Gates and Accessories	1956-58	47,000
Gasoline Engine Generator	1956-58	20,000
Exterior electrical Work	1956-58	40,000
Utility Building	1956-58	71,000
Water Supply Wells	1956-58	5,463
Operators Quarters	1956-58	60,809
Water Softening Equipment	1956-58	1,029
Road Around Operators Quarters P. O.	1956-58	1,988
Permanent Operating Equipment	1958	15,500
Total Project Cost 1948 to 1958		\$2,150,159

d. List of Project Contracts:

<u>Project</u>	<u>Contractor</u>	<u>Date (s)</u>	<u>Contract No.</u>	<u>Amount</u>
Dam and Appurtenant Structures	Lane Construction Co.	Apr '56 - May '58	56-1354	\$1,410,729.82
Reservoir Clearing	Joseph A. Abretti & Son	Feb '58 - May '58	58-307	39,312.00
Electric Service	Mass. Electric Co.	May '56	56-166	10,000.00
Installation of Piezometer - left bank of river downstream of dam	Gov't Forces	20 Dec '57	-	-
Road around Operators Quarters	-	1958	Purchase Order	1,988.00
Two-way radio maintenance including monthly check	Motorola Communications & Electronics, Inc. Fairbrother Radio Service 29 Alden St., Greenfield, Mass.	1 Dec '58 -	NEDSP-59-1077	
Erosion Repairs to Dike #3	Gov't Forces	July '59	-	1,334.32
Installation of Sediment Ranges, Monuments and Reference Markers	Gov't Forces	1960	-	
Erosion Control downstream of dam	Gov't Forces	Mar '60	-	2,000.00
Resurfacing Access Road to dam and installation of guard rail across dikes		Oct '62 - Jan '63	63-55	21,294.20
Radio Service	Motorola	Nov '64	65-10	

<u>Project</u>	<u>Contractor</u>	<u>Date (s)</u>	<u>Contract No.</u>	<u>Amount</u>
Resurfacing top of dam & dike	McDonald & Donovan	July '65	66-10	
Repairs to Operating House	Allied Weatherproofing Co.	Oct - Dec '65	66-27	\$3,980.00
Resurfacing Roads	F.J. Keating & Co.	Sep '65	66-15	4,240.00
Prefab Storage Bldg.	Gilbert Ames, Inc. Erected by Gov't Forces	'67	67C0033	2,647.69
Utility Bldg. Addition	Gov't Forces	1969-70	-	
Utility Bldg. Addition	Gov't Forces	1970-72	-	
Indepth Inspection & Evaluation of Spillway Bridge	Edwards & Kelcey, Inc. (Est. repair cost \$3,150)	Jan '72	DACW33-72-C-0014	6,569.78

e. License No. DA-19-016-CIVENG-63-171, dated 8 January 1963, Commonwealth of Massachusetts, Division of Fisheries & Game.

f. Lease. The Dam, Dikes, and operating areas are owned by the Federal Government. The Federal Government holds a Flooding Easement on the Reservoir Area which is owned by the Metropolitan District Commission.

PART II - OPERATION AND MAINTENANCE

CHAPTER I - GENERAL

a. Scope. Part II of the manual covers the operating and maintenance instructions; limits, and criteria for only the major or critical project equipment and facilities and only information actually needed for the guidance of the Project Manager and others concerned with the operation and maintenance of Barre Falls Dam, Ware River, Massachusetts by trained operating personnel. Information that is obvious for association with project equipment or available from maintenance manuals is not included. Chapter 1 is the introduction of Part II of the manual and includes miscellaneous items and supplementary information and requirements not included elsewhere.

b. Maintenance. (1) Inasmuch as mechanical and electrical equipment deteriorates more rapidly from idleness than continued use, all such equipment and facilities require periodic operation at frequent intervals. Periodic operation of equipment permits an inspection of the functioning of all parts so that defective ones may be replaced or repaired before their use is required for project operations. The performance of complete periodic maintenance routines as outlined in later chapters of this manual and in the appropriate maintenance manual for each piece of equipment will insure that the equipment is in proper running order at all times.

(2) Maintenance standards for the dam and reservoir not specifically covered in this manual will be consistent with objectives set forth in ER 1130-2-400 and the criteria established for recreation facilities in EM 1130-2-312. Facilities will be maintained at a standard that provides adequate protection for the health and safety of the public and shall meet and may exceed the health and sanitation laws of the State, county or city in which the project is located.

c. Safety. The Project Manager and his assistants shall be familiar with Corps of Engineers Safety Manual "General Safety Requirements" (EM 385-1-1 dated 1 March 1967) and shall comply with all applicable provisions.

d. Regulation Procedures. The Reservoir Control Center, Engineering Division, is responsible for regulation of flood control reservoirs. These procedures are included in the Connecticut River Basin Master Manual of Reservoir Regulation, Appendix G, Chicopee River Watershed, for Barre Falls Dam. The operation and maintenance of all hydrologic instruments is included under the regulation manual.

e. Supervisory Responsibilities. The Project Manager will, in general, be supervising from one to several employees. He must make sure that all employees know just what is expected of them and must see that all employees carry out their duties in a workmanlike manner.

The Project Manager will plan all the work for his employees ahead of time and procure all necessary materials and equipment so that when employees get through one job they can be instantly assigned to another job. Work schedules should be set up so that work items can be completed as work conditions allow.

A good supervisor will so plan his work that one job works in well with another.

The work should be scheduled during the year so that the work to be accomplished inside of buildings may be performed in the winter months.

In the summer, the Project Manager will have a list of projects planned, both for outdoor work and indoor work. The rules and instructions set forth in this manual are for assuring that the Project Manager will have the equipment and dam in such condition that it will always be ready for emergency operation.

f. Leave. The Basin Manager shall be advised in advance whenever the Project Manager will be absent overnight from the dam or from his home. Extended annual leave will be requested from his Basin Manager. In event of emergency leave, telephone or radio contact shall be made with the Basin Manager. In all instances, the assistant project manager will be advised the detailed information as to his location and method of contact.

g. Public Relations. Project Managers should always bear in mind that they are representing the Corps of Engineers, U.S. Army, and that people within a radius of many miles think of them in that capacity. They must be diplomatic and careful in their statements, or they will find that observations lightly or facetiously made, are given disproportionate weight and publicity, very much to their embarrassment and that of the Division.

Project Managers are to be pleasant and courteous in their dealings with the public. They are expected to know, generally, the reasons for the main features of the dam, what purpose they serve and why they were so constructed. Project Managers are not expected to maintain "open house" all the time at the dam to show visitors around. However, if representative groups wish to arrange to inspect the structures, the Project Manager should accompany them. If public officials or visitors having more than a curious interest visit the dam, the Project Manager will conduct them over the project and explain as much as possible the functions of the dam. He should take pride in his job, for it is a responsible one, and in his organization; the result will be public confidence in him, the structure and the organization.

Owners of adjacent property and riparian residents who may be affected by reservoir operations should be treated in a friendly and tactful manner. Proper questions should be civilly and reasonably answered. We have nothing to hide. Explanations should be made in manner and detail as to preclude misunderstanding and subsequent criticism. Forecasting of river stages or crests or extent of damages shall be avoided. River stage forecasting is the responsibility of the U.S. Weather Service; therefore, particular care must be exercised that comments are not construed to be river stage predictions.

h. Real Estate Outgrant Administration. The Project Manager will forward with his comments any inquiries for outgrants to the Basin Manager. He will monitor all existing outgrants, and report all irregularities to the Basin Manager.

i. Summary of Service Duties.

(1) Daily

- (a) Water surface reading from water level recorder.
- (b) Precipitation reading from rain gage.
- (c) Read and record thermometer values.
- (d) Record weather observations on U.S.W.S. Form E-14 and Form 612-14.
- (e) Clean rest and toilet rooms.
- (f) During period of flood flow check operation of all remote recorders and telemarks.

(2) Weekly

- (a) Operate standby unit up to operating temperature to provide power for tests.
- (b) Test traveling crane.
- (c) Change rain gage and weekly pool elevation charts.

(3) Monthly

- (a) Inspect reservoir area.
- (b) Lower service gates to closed position.

- (c) Inspect battery and air filter on standby unit.
- (d) Inspect power and telephone lines.
- (e) Change monthly pool elevation chart and rain gage tape.
- (f) Operate engine-generator unit for two hours.

(4) Every Six Months

- (a) Inspect gatehouse.
- (b) Check all concrete structures.
- (c) Change crankcase oil in standby unit.
- (d) Inspect foundation drains May and November.

(5) Annually

- (a) Check seal of gate when pool is drained.
- (b) Oil bearings and worm gear in floorstand limit switch.
- (c) Winter-change rain gage.
- (d) Spot paint spillway bridge.
- (e) Check condition of anti-freeze each fall in all diesel and gasoline engines and install new or additional as required.
- (f) Inspect and test life preserver vests.
- (g) Inventory

i. Reports.

- (1) Daily Log. A daily log or record book will be maintained by the Project Manager. Entries should be made daily and should include notes of all activities outside of normal routine. The entries should be complete and should provide a record of all consequential events concerning the dam and reservoir area, daily 8 a.m. pool and outflow readings.

- (2) Weekly gate operation and pool elevation report NED Form 90.
- (3) Monthly report of maintenance.
- (4) Monthly receiving report for electrical and telephone service.
- (5) Safety report NED 618.
- (6) Monthly climatological report WB Form 612.14.
- (7) Snow course reports as required.
- (8) Flood control observations after each operation for flood control.
- (9) Weekly hydrology report NED Form 477.
- (10) Daily river and rainfall report USWS Form E-14.
- (11) Project monthly visitation data NED 545.
- (12) Weekly motor vehicle trip ticket NED 614.
- (13) Record of Purchases Monthly NED 236.
- (14) Quarterly fuel consumption report.

With the exception of "Daily Log" the above-listed reports and records are submitted on prepared forms which are self-explanatory.

k. Recommended List of Spare Parts and Firefighting Equipment.

Spare Parts. Each dam should have as a minimum a store of the following spare parts. An expeditious local source of supply of spare parts will suffice in lieu of storage of spare parts at the project.

(1) Electric Generator Unit.

(a) Engine, Gasoline

1. Fuel Pump
2. Set of points for battery distributor
3. Rotor for battery distributor
4. Distributor cap for battery distributor
5. Condenser for battery distributor
6. Set of points for magneto

7. Condenser for magneto
8. Coil
9. Fan belt
10. Two exhaust valves
11. Four valve springs
12. Two intake valves
13. Head gasket
14. Complete set of manifold gaskets
15. Oil filter

(b) Engine, Diesel

1. Fuel pump
2. Two fuel injector nozzles
3. Fan belt
4. Two exhaust valves
5. Four valve springs (four-cycle only)
6. Two intake valves (four-cycle only)
7. Head gasket
8. Complete set of manifold gaskets
9. Fuel filter
10. Oil filter

(c) Generator

1. Set of brushes for exciter
2. Set of brushes for generator field
3. Two springs for exciter brushes
4. Two springs for generator field brushes

(2) Electrical

1. Twelve fuses for every size used on job
2. 100 ft. of No. 12-600 volt wire, 2-conductor
3. Two rolls rubber tape
4. Two rolls friction tape
5. Spare floodlight bulbs
6. Fuse puller

(3) Firefighting Equipment. The dam has a portable fire pump and will keep the following standard equipment complement, stored in an easily accessible place, along with the pumper:

1. 10 batteries, flashlight
2. 1 small tool box
3. 1 oil can, squirt
4. 1 five-gallon can, Protectoseal, Underwriters Laboratories approved, filled with four gallons of regular gasoline

5. 1 pump backpack carrier
6. 2 starting cords
7. 2 flashlights
8. 1 2-in oil funnel
9. 1 screened funnel
10. 50 hose gaskets, 1-1/2"
11. 1 one-pound can of cup grease
12. 1 peen hammer
13. 2 flexible gasoline hoses
14. 2,000 feet of 1-1/2" linen hose
15. 50 feet of 1-1/2" suction hose
16. 2 eight-foot lengths of 1-1/2" suction hose
17. 1 first aid kit, filler only
18. 1 pint oil measure
19. 2 nozzles, 1-1/2" (1 adjustable fog & 1 combination)
20. 6 quarts of oil (outboard motor oil - SAE 30) in cans
21. 1 oil can opener
22. 1 galvanized pail
23. 1 pair of adjustable pliers
24. 2 pounds of rags
25. 1 screwdriver
26. 2 sets of sparkplugs (extra)
27. 1 suction strainer, 1-1/2" (disc type)
28. 1 5-gallon gasoline tank (empty)
29. 2 rolls friction tape
30. 1 check and bleeder automatic valve
31. 1 pressure relief valve (this may be in combination with the automatic check valve)
32. 2 bleeder valves
33. 1 Siamese valve
34. 2 Wescott type wrenches
35. 1 set of ignition wrenches
36. 1 pump wrench
37. 1 sparkplug wrench
38. 2 spanner wrenches

(4) All other spare parts recommended by manufacturers manuals.

1. Listing of Drawings. The following drawings cover the major items covered under this manual. Those indicated by asterisk are inserted at the end of Part II of the manual.

(1) Construction of Dam and Appurtenant Structures, (Feb 1956)

<u>Title</u>	<u>Sheet No.</u>	<u>Drawing No.</u>
Project Location and Index (Feb 56)	1	CT-1-3073
*General Plan	2	CT-1-3074
*Dam - Detail Plan	3	CT-1-3075
*Dam - Embankment Details No. 1	4	CT-1-3076
Dam - Embankment Details No. 2	5	CT-1-3077

DIKES

*Dikes - Plan and Profile No. 1	6	CT-1-3078
*Dikes - Plan and Profile No. 2	7	CT-1-3079
Dike No. 1 - Embankment Details	8	CT-1-3080
*Dikes No. 2 and 3 - Embankment Details	9	CT-1-3081

ACCESS ROAD

Access Road "A" - Plan and Details No. 1	10	CT-1-3082
Access Road "A" - Plan and Details No. 2	11	CT-1-3083
Access Road "C" - Plan and Details No. 1	12	CT-1-3084
Access Road "C" - Plan and Details No. 2	13	CT-1-3085

SPILLWAY

*Spillway - Plan and Profile	14	CT-1-3086
Spillway - Sections	15	CT-1-3087
Spillway - Detail Plan and Sections	16	CT-1-3088
Spillway - Concrete Details No. 1	17	CT-1-3089
Spillway - Concrete Details No. 2	18	CT-1-3090

ACCESS BRIDGE

Access Bridge - Plan and Sections	19	CT-1-3091
Access Bridge - Details	20	CT-1-3092

<u>Title</u>	<u>Sheet No.</u>	<u>Drawing No.</u>
<u>OUTLET WORKS</u>		
*Outlet Works - Plan and Profile	21	CT-1-3093
Outlet Works - Sections	22	CT-1-3094
Intake Channel Walls - Concrete Details No. 1	23	CT-1-3095
Intake Channel Walls - Concrete Details No. 2	24	CT-1-3096
Gate Structure - Concrete Details No. 1	25	CT-1-3097
Gate Structure - Concrete Details No. 2	26	CT-1-3098
Gate Structure - Operating Floor Steel Reinforcement	27	CT-1-3099
Gate Structure - Heater Room Floor Steel Reinforcement	28	CT-1-3100
Gate Structure - Steel Reinforcement No. 1	29	CT-1-3101
Gate Structure - Steel Reinforcement No. 2	30	CT-1-3102
Gate Structure - Steel Reinforcement No. 3	31	CT-1-3103
Gate Structure - Steel Reinforcement No. 4	32	CT-1-3104
Conduit Transition - Concrete Details	33	CT-1-3105
Conduit - Concrete Details	34	CT-1-3106
Conduit and Transition - Steel Reinforcement	35	CT-1-3107
Outlet Portal - Concrete Details	36	CT-1-3108
*Gate House - Plans and Details	37	CT-1-3109
Gate House Elevations	38	CT-1-3110
Gate House - Entrance Details	39	CT-1-3111
Gate House - Details	40	CT-1-3112
Gate House - Roof Slab-Steel Reinforcement	41	CT-1-3113
Service Bridge - Plan and Sections	42	CT-1-3114
Service Bridge - Abutment Details	43	CT-1-3115
Gate House - Electrical System - Conduit Layout	44	CT-1-3116
Gate House - Electrical System - Wiring Diagram and Details	45	CT-1-3117
Gate Structure - Arrangement of Equipment No. 1	46	CT-1-3118
Gate Structure - Arrangement of Equipment No. 2	47	CT-1-3119
Slide Gates and Conduit Liners	48	CT-1-3120
<u>MISCELLANEOUS</u>		
Exterior Electrical Details	49	CT-1-3121
Miscellaneous Metals - Details No. 1	50	CT-1-3122
Miscellaneous Metals - Details No. 2	51	CT-1-3123
Miscellaneous Metals - Details No. 3	52	CT-1-3124
Tile and Staff Gages	53	CT-1-3125

<u>Title</u>	<u>Sheet No.</u>	<u>Drawing No.</u>
<u>UTILITY BUILDING</u>		
Utility Building - Location Plan and Details	54	CT-1-3126
*Utility Building - Plans and Details	55	CT-1-3127
Utility Building - Elevations	56	CT-1-3128
Utility Building - Sections and Details	57	CT-1-3129
Utility Building - Truss and Miscellaneous Details	58	CT-1-3130
Utility Building - Plumbing, Heating and Electrical	59	CT-1-3131
<u>PUMP CHAMBER</u>		
Pump Chamber Details	60	CT-1-3132
<u>OPERATORS QUARTERS</u>		
Operator's Quarters - Location Plan and Details	61	CT-1-3133
*Operator's Quarters - Floor Plans	62	CT-1-3134
Operator's Quarters - Elevations	63	CT-1-3135
Operator's Quarters - Details	64	CT-1-3136
Operator's Quarters - Plumbing, Heating and Electrical	65	CT-1-3137
<u>FOUNDATIONS</u>		
Dam - Plan of Foundation Explorations	66	CT-2-1441
Dam - Geologic Sections	67	CT-2-1442
Dikes - Plan of Foundation Explorations	68	CT-2-1443
Dikes - Geologic Sections	69	CT-2-1444
Borrow Areas - Plan of Borrow Explorations	70	CT-2-1445
Record of Foundation Explorations No. 1	71	CT-2-1446
Record of Foundation Explorations No. 2	72	CT-2-1447
Record of Foundation Explorations No. 3	73	CT-2-1448
Record of Foundation Explorations No. 4	74	CT-2-1449
Record of Borrow Explorations	75	CT-2-1450
Sources of Construction Materials for Embankments	76	CT-2-1451
<u>HYDROGRAPHS</u>		
Hydrographs No. 1	77	CT-3-1292
Hydrographs No. 2	78	CT-3-1293

<u>Title</u>		<u>Sheet No.</u>	<u>Drawing No.</u>
<u>RESERVOIR</u>			
Easements and Acquisitions		1	CT-1-1451
Real Estate - Barre Falls Dam and Reservoir	(Mar 56)	1	NED-PA-1289
Barre Falls Reservoir Map	(Feb 56)	1	CT-1-4074
Reservoir Clearing	(Dec 59)	1	CT-1-4448
Sedimentation	(Aug 61)	2	CT-9-1217

(2) Miscellaneous Contracts

Operator's Quarters - Modifications to Heating System		1	CT-5-1661
Service Road at Operator's Quarters	(Sept 58)	1	CT-1-4365
Resurfacing Access Road & Installation of Guard Rails	(Aug 60)	1	CT-1-5860
Resurfacing Access Road - Site Plan and Index	(Aug 62)	2	CT-1-5861
Installation of Guard Rails - Dikes 1, 2 & 3 (Contract 63-15)	(Aug 62)	3	CT-1-5862
Repairs to Operating House - Plan, Elevation & Location Plan (Contract 66-12)	(Aug 65)	1	CON-35
Repairs to Operating House - Elevations & Details		2	CON-35
Barre Falls Dam Information Sign			—
Resurfacing Road Across Dam & Dike (Contract 66-15)	(Aug 65)		CON-32

(3) Utility Building

Electrical Modifications	SK138	(1967)
Building Addition	SK162	(1969)
" "	Sketch	(1971)

(4) In Depth Inspection and Evaluation
of Spillway Bridge

Cont. #DACW33-72-C-0014
(Estimated repair cost 3150)
(Jan 72)

Edwards and Kelcey, Inc.
Engineers and Consultants
470 Atlantic Avenue
Boston, Massachusetts 02210

(Next in depth inspection in 8 to 10 years
depending on findings of interim two year
inspections as recommended in ER1110-2-99).

m. Equipment and Drawing Files. This manual does not include operating and maintenance instructions and other maintenance information which are covered or included in the equipment and drawing files of the Project Manager. These files include operating manuals, design memorandum, shop drawings or equipment, catalog cut and maintenance instructions, and other supplementary information. The items on file are as follows:

(1) Operating Manuals:

- (a) Operation & Maintenance manual for
WX & WXL series gasoline Engines
Hercules Motors Corp.
Canton, Ohio, USA. March 8, 1953
(Russell Co. Transfer SW.
E.M. Synchroonous Generator &
Hercules Engine, 60Y1, Model, (WXL3).
- (b) Bolen's Tractor -
Operation & Maintenance Manual
Parts Catalog
Instruction Book - Wisconsin Air Cooled Engines
- (c) Pacific Marine Portable Pumper -
Service Manual
- (d) Flail Mower -
Owners Manual
- (e) Ford Tractor -
Operators Manual

- (2) Definite Project Report
March 1948
Revised Sept. 1948
- (3) Analysis of Design
. 1951
- (4) General Design Memorandum
Feb. 1956
Revised 25 April 1956
- (5) Specifications for the construction of Dam and Appurtenant Structure
Volume.1 & 2. March 1956

(6) Shop Drawings -

<u>Title</u>	<u>Dwg. or Sh. No.</u>
Philadelphia Gear Works	
Final Calculations - Limitorque Size	
Limitorque Valve Control -	Dwg. No. C-78108
Wiring Diagram -	" " C-66719
Wiring Diagram -	" "" C-67084
Final Calculations	
Northeastern Engineering Inc.	
Bill of Materials	
Gen. & Dist. SWBD. for Barre Falls	" " 18307
Gen. & Dist. SWBD. for Barre Falls	" " D-19004
R.G. Russell Co.	
40 K.W. Emergency Generator	" " R-1021
40 K.W. Emergency Generator	" " R-1021, Re 4.1
United Iron Works, Inc.	
Aluminum Opening Cover	Sheet 1
Suggested Flange for Interior Stair Railing	Dwg. No. 1
Bethlehem Steel Co.	
Access Bridge-Pins, Shoes, Exp'n Base Plates	Sheet 1
Access Bridge-Girders,- G1 - G2	" 2
Access Bridge-Girders, G1 - G2	" 3
Beams	" 4
Access Bridge-Expansion Dams	" 5
Service Bridge-Girders, Beams, and Base Plates	" 6
Access and Service Bridges- Anchor Bolts Plans	" E1
Service Bridge- Steel Framing Plan	" E2
Access Bridge- Steel Framing Plan	" E3
Plantation Steel Co.	
Headwall Details, L Type Headwall Details, Drop Inlet Details	
Handhold Details, Flagpole Details, Valve Chamber Cover Details,	
2E- 2T Duct Details-	Sheet P9
Gate Structure	" P10
Gate Structure	" P11
Gate Structure	" P12
Stairs	" P13

<u>Title</u>	<u>Dwg. or Sh. No</u>
Gatehouse- Elec. System- Conduit Layout	Shop Dwg.
Miscellaneous Conduit Details	
Morse Brothers Electrical C. Inc.	
Detail Drawing- Exterior Electrical Work	Material Sheet
Exterior Electrical Work	Dwg. E1
Exterior Electrical Work	" E2
Exterior Electrical Work	" E3
McCormick Longmeadow Stone Co.	
Indiana Limestone	Dwg. No. 1
Albre Marble & Tile Co.	
Tile Gage	" F21E
John E. Lingo & Sons Inc.	
Flag Pole and Base	" 71956
Chamberlin Co. of America	
Glass Channel	Dwg. No. AE1
Head & Jambs	" " AE9
Cross Rail	" " AE10
Sill	" " AE11
Screen Rail	" " AE23
Sub Frame	" " AE 36A
Alum. Comb. Door	" " 30929
H.H. Friedrich Co.	
#16 Ga. Flush Type Hollow Metal Door	
Power Products Co. Inc.	
Conduit Support	" " 1001E
Lane Construction Co.	
Proposed Cofferdam	
Rodney Hunt Machine Co.	
Specification & Procedure Sheets	
Design Calculations, Disc, Stem & Hoist	Dwg. F5026
Detail -Under Floor Stem Guide, BRZ Bushed	" E2712C
Detail of Bolts for Hoist Attachment	" F4911
Assembly 54" X 108" Slide Gate	" C2936
Installation Slide Gate 54" X 108"	" C2942

<u>Title</u>	<u>Dwg. or Sh. No.</u>
Detail- Disc for 54" X 108" Slide Gate	Dwg. C-2897
Assembly- Stem Guide, Range 6" to 13"	" E-2366-A
Detail- Torque Plate & Double Gib Head	" E-4275
Detail- Stop Plate for 54" X 108" Slide	" D-4833
Detail- Guide Extension Frame	" D-4859
Detail- of Conduit Liner	" C-2887
Detail- Frame for 54" X 108" Slide Gate	" C-2918
Detail- Stop Plate for 54" X 108" Slide	" D-4833
Detail- of Conduit Liner	" C-2889
Detail- Guides for 54" X 108" Slide Gates	" D-4811
Detail- Standard Anchor Bolt List	" E-3020

CHAPTER 2 - DAM AND DIKES

a. Slopes and Gutters. (1) Slopes (Cover Rock, Gravel, Grass). The slopes of the dam, including those protected by rock or gravel, must be carefully watched for settlement or erosion. Slopes shall be kept free of debris; rock and gravel slopes shall be kept free of vegetation.

(2) Burrowing animals constitute a hazard to any embankment. Although there is little probability of rodent holes beneath a rock fill which is bedded on gravel, the Project Manager should watch for rodents around the slopes and destroy them by poison traps. Gravel slopes shall be maintained in a smooth even plane.

(3) Protection Stone. Protection stone of all types shall be kept free from debris and vegetation; dislodged stones must be promptly replaced.

(4) Grassed Slopes. Periodic inspections shall be made of all grassed slopes and other grassed areas to note subsidences, slides, erosions, etc. Corrective action in the form of drains, previous blankets, etc., will be directed by the Operations Division when the failures or incipient failures are of substantial magnitude. All grassed areas shall be mowed at least once a year. On many areas it will be necessary to mow two or more times a year to keep up the appearance and discourage the growth of weeds. When necessary to reestablish turf, the seeding operations will start at the earliest practicable date in the spring or fall to obtain the greatest possible protection against erosion. Areas requiring seeding shall be dressed to proper grade, and irregularities in the surface removed. The surface should then be raked or harrowed parallel to the contour of the slope (never up and down) to a depth of three-quarters of an inch. Debris shall always be removed promptly, deposits of debris are unsightly, detrimental to the growth of grass and encourage the nesting of rats and other burrowing animals.

(5) Gutters. These shall be kept in effective condition with displaced rock promptly replaced. Principal hazard is from erosion at edges, caused by flows beyond the capacity of the gutter or by blockage. Failure is progressive and rapid.

(6) Observations shall be made for potentials for major rock falls or slides in spillway and outlet works where blockage may result. Report such potential falls promptly to Operations Division and Basin Manager.

(7) Embankments and Fills. Visual observations by employees working on or near embankment fills for erosion, slides, settlement, springs, boils and other unusual conditions. Close inspection yearly of embankments and fills to detect leaks, settlement, excessive erosion, and slides. The embankment and fills should be maintained to original grade and alignment. Repair depressions or washouts that might tend to weaken the embankment or fill.

b. Interceptor Pipe Drains. Pipe drains run along the downstream side of dam without falls to grade. In general, the drains were constructed in straight runs between manholes. The underdrains shall be inspected at least once a year to determine if sections are crushed or are partially or fully filled. Our inspection method is by placing a light at the end of a run in a manhole and detecting the condition or run by placing a sloping mirror (inverted periscope) in a adjacent manhole. Report any indication of filling or obstruction to Basin Manager.

d. Inspection During floods. (1) The behavior of the dam and dikes during floods is of vital importance and interest. Periods of storage are the times of danger and, if weaknesses develop, it is essential that they be noted and prompt corrective action taken. The Project Manager must recognize that a condition which is of minor importance with a relatively low head may assume serious proportions with increasing pool levels, and he must be constantly alert to note and report even minor failures or changes in the conditions of the embankment. Results of a single careful inspection of an embankment during a flood can be more significant and valuable than a great number of equally careful inspections when the embankment is not impounding water.

(2) When the reservoir is filling or is storing water, the Project Manager will inspect the exposed faces of the dam and dikes with particular attention to the downstream faces of the dam and dikes, the dam abutments, and the area adjacent to downstream face of dam and dikes for "springs", sand boils, subsidences, sloughing of embankment or abutments, or other indication of leakage through, around or under the dam and dikes. Any evidence of increased flow from new "springs" or the movement of soil particles shall be immediately reported.

(3) When the reservoir is being drawn down, the Project Manager will inspect the exposed faces of the dam and dikes, with particular attention to the upstream faces and abutments for slides or indications of incipient slides. The Project Manager will also observe if there is any slides or sloughing of bank in reservoir areas. On the dam and dikes proper, the guard rails on top of the dam and dikes, if well aligned, will provide a means to detect lateral movement of the dam and dike tops that may precede a slide. Any evidence of slides or incipient slides shall be reported immediately.

(4) During the first filling of the reservoir, and each time the reservoir is filled to a higher level than previously experienced, inspection of the downstream faces of dam and dikes shall be particularly detailed and conducted at least twice daily during storage and at least three times weekly during drawdown until two weeks after completion of drawdown. During subsequent filling, storage and drawdown periods, inspections of the embankment may be conducted less frequently, but when above El. 783, never less than once a day during filling and storage and during drawdown.

CHAPTER 3 - INTAKE AND OUTLET WORKS
RETAINING WALLS, SPILLWAY AND BUILDINGS

a. Concrete and Masonry and Exterior Surfaces - General. (1) Visual inspection by employees working on or near the dam to detect cracks, leaks, collection of ice or heaving slabs; movement and misalignment of walls, debris formation, displacements, offsets at joints, or other irregularities. A close and more complete inspection to detect cracks, leaks, spalling, and deterioration of concrete or masonry will be made semi-annually. Normally, concrete and masonry structures required only limited maintenance; however, when failures occur, report conditions to Basin Manager so that timely repairs can be made by others in order to prevent serious damage requiring replacement or costly repairs.

(2) Expansion Joints. Visually inspect annually for signs of leaks, defective joint material or faulty water stops. Clean joints and fill with filler as required. Report required repairs as necessary.

(3) Concrete. The concrete structures shall be carefully inspected at intervals of six months and after each major filling operation. The inspection shall include a survey of the general conditions of the concrete surfaces, noting location and extent of cracks, crazing and spalling, and other type of deterioration or disintegration that may have developed, the accumulation of debris, and other unusual conditions. Surfaces adjacent to cracks shall be inspected for differential movement; similar inspections shall be made of construction and expansion joints. Any point or points of leakage will be noted and the condition of all water passages inspected for evidence of erosion or cavitation. The exposed portion of embedded items and the concrete adjacent thereto shall be carefully inspected. All drain holes shall be cleaned. Any condition requiring or suspected to require corrective action shall be brought to the attention of the Operations Division immediately. The inspection shall be made a matter of record with report submitted to Operations Division, including a sketch showing the location and nature of the defects. All accumulated debris shall be removed at spillway, outlet structure, channels, etc.

(4) Exterior Surfaces. Visually inspect all surfaces annually (except as otherwise stated) to discover cracks, damaged finishes, broken block or brick, faulty joints, missing, warped, or defective siding; check around all openings for cracks and leaks; check metal siding for loose nails, defective siding; check around all openings for cracks and leaks; check metal siding for loose nails, defective gaskets or fastenings. It should be noted that exterior surfaces of intake structure will

be made semi-annually. Project Manager shall repair and replace damaged surfaces to the extent of his ability; report conditions not considered repairable by Project Manager to the Basin Manager.

b. Retaining Walls. (1) In cases where the slopes are confined by a retaining wall, the wall shall be normally inspected every two years except inspection shall be made daily when the pool level is equal to half the height of the dam. Any movement, cracks or seepages through or around the wall must be noted and promptly reported.

(2) Irregularities such as stress cracks, settlement, tilting, erosion along top of wall, clogged weep holes, deterioration of wall material, displacement, and undercutting of foundation. Provide good drainage to prevent erosion and scouring at the base and top. Keep weep holes open.

c. Trash Racks. When the flow through the trash racks is at a minimum, trash racks shall be inspected and painted as required. All debris collecting at the racks shall be removed after each operation involving storage of water by removing the debris from the intake channel by boat or otherwise.

d. Log Booms. The log booms will be inspected monthly for broken logs or evidence of rot near holes that contain the ends of the boom chains, and for damaged cables or chains. When operating during large inflows into the reservoir or when ice is in the river, the log boom will be under stress and must be at full strength at all times. Logs not floating will be placed on concrete blocks to keep them off the ground. Spare boom logs shall be available and shall be stored off the ground. All debris collecting behind log booms shall be removed during inspection and especially after large inflows into the reservoir.

e. Tile and Staff Gages. Clean the tile and staff gages regularly to facilitate reading. When cleaning the gages, check for cracking, spalling, or abrasions, and insure that gages are securely in place, including staff gauge upstream of Coldbrook intake.

f. Buildings. (1) Roofing and Flashing. Close inspection shall be performed semi-annually to detect leaks, loose or missing shingles, blisters, weathered built-up roofing, displacement of gravel, damaged ridge or valley coverings; particularly check plastic flashings at vents, and vertical intersections of roof; check metal flashings and counter flashings for loose seams rusting or galvanic action. Following heavy rains or severe storms check roofing and flashings for leaks, missing or damaged shingles or other damage.

The secret of trouble-free low-cost maintenance is a regular re-saturation of the membranes or plies of felt while it is still sound.

Gravel or slag surfaced roofs need only spot resaturation where the membrane has become exposed, replacing gravel over the resaturated area. Open up large blisters and repair to protect underlying plies. Keep roof drains open and roof well drained. Indication of water under membrane should be thoroughly investigated to locate the source and repair immediately. Investigate all cracks or other defects and if more than a single ply is affected, repairs should be made promptly.

(2) Floors. Examine annually floors (concrete) for cracks, settlement, scaling, dusting, pitting and deterioration; (wood) buckling, splintering, loose boards, sagging, loose or missing covering materials; asphalt, quarry, ceramic and vinyl tile floors for condition.

(3) Railings and Metal Work. (a) All metal work on equipment, gratings, railings, ladders, etc., shall be kept neatly painted. Windows shall be kept well flashed. Front entrance doors shall be examined, particularly on the top, for holes. The metal doors shall be completely sealed to prevent the entrance of moisture which would corrode the door from the inside. All holes shall be promptly sealed. Changes in color shall not be made without prior approval.

(b) Examine supports, treads, railings, grating, anchors and bolts for rust, deterioration and rigidity every two years.

(c) In order to assure that maintenance is adequate and timely, performance of the following is essential:

Tighten all loose bolts and anchorage items and replace any missing nuts.

Repair all broken welds and defective members.

Replace worn or slippery treads.

Keep all stairways, landings and catwalks cleaned of debris, free of obstructions, grease, and oil and keep hand railing rigid and well secured to base.

Replace broken catch basin and manhole covers promptly.

(4) Windows, Doors, and Screens. Once each year, check weather stripping, calking around framing, stops, door closers, locks, latches, screens, glazing, hinges and stiles. Following heavy rains or severe storms make an inspection to determine extent of damage to windows and doors. Replace broken glass promptly.

(5) Wood framing and sheathing. Every two years, check for dry rot, loose or missing boards or shingles, warped, checking, settlement, leaks, or other irregularities. Make close inspection of floor joists, sills, and beams for termite damage.

Maintain sufficient ventilation under floor areas to dispel moisture and undesirable odors. Replace or reinforce defective material and treat for termites as necessary.

(6) Gutters and Downspouts. Inspect condition, every two years, of fixed and slip joints, check gutter hangers, and spacers for adequacy, tightness, alignment, rust, deterioration, clogged strainers or downspouts, leaves or debris.

(7) Interior Walls and Ceilings. Close inspection every two years to detect cracks in plaster, water stains, deteriorated plaster, broken or damaged tile, mildew, broken or damaged wall board or paneling, disfiguration or other damage.

(8) Insect Control. Insects shall be disposed of by periodic spraying and/or treatment.

(9) Stairways, Wood. Check condition, every two years, of treads, handrails, and anchorage for wear, deterioration and safety conditions.

g. Bridges. Bridges will be inspected periodically by Engineering Personnel to determine the condition of the bridge and to note evidences of damage or incipient failure.

CHAPTER 4-UTILITIES

a. Water Supply and Sewer Systems. (1) Observe component of each system weekly for good condition and proper operation in connection with water wells, distribution lines, treatment facilities, etc.

Each year the above systems shall be closely inspected for good condition and proper operations. Drain and clean systems thoroughly, as applicable, to insure satisfactory operation. All pneumatic and gravity storage tanks come under the above requirement.

(2) Portable Water Tests. All water treated by the Project Manager shall be tested semi-annually for chlorine content. Send sample of water for analysis as required by State or local authority. Where there are no local or State requirements, water shall be analyzed at least semi-annually.

(3) Piping. When in the area of piping, observe for indications of leaks. Where possible examine systems for leaks, excessive corrosion or other damage annually. Inspect pipe covering or coating where provided. Repair or replace piping, covering or coating as needed to maintain good condition. Clean piping system as necessary. Check piping system identifying markers, clean and replace as required.

(4) Valves. When in the area of valves, observe for indications of leaking valve stem, flanges or connections. Inspect valves for leaks and general condition annually. Renew packing if needed. Reseat or replace valve and tighten connections as required. Be sure valve is left in normal operating position.

(5) Plumbing Systems. Check annually plumbing fixtures and exposed pipe and pipe covering for leaks, malfunctioning and damage. Check relief valves of hot water tanks.

(6) Sewer Systems. Inspect annually grease trapes, fixture traps, discharge lines, septic tanks and leaching fields for proper functioning and leaks.

(7) Water Well. Check top of casting semi-annually for damage which will permit surface water to enter, check hand-type pumps for damage or malfunction, drain before freezing weather.

Water from wells or other sources provided for human consumption shall meet State and local requirements. Water tests will be made as required by the State Health Agency and in a manner approved by that agency. Contaminated wells will be closed to public use. Well will be capped and maintained in a manner to preclude contamination from surface run-off.

b. Heating and Ventilating. (1) General. Observe for proper operation.

(2) Duct Systems. Check duct system for general over-all condition once a year. Tighten loose connection and supports as needed. On systems using oil-type air filters be sure that oil vapor is not being carried over into duct system. Clean system as required to maintain good condition.

(3) Louvers and Dampers. Observe louvers and dampers for proper functioning and good condition. Adjust, repair and clean annually or as necessary for good operation.

(4) Air filters. Observe air filters bi-monthly for good condition and proper operation. Replace dirty filters.

(5) Heating and Ventilating Fans. Observe belt drives semi-annually for condition and satisfactory operation. Repair and clean fans as necessary to maintain good operating condition.

(6) Plenum chambers. Observe condition of plenum chambers. Inspect doors for good seals and latches. Repair, adjust and clean as needed.

(7) Heating and Ventilating Controls. Examine all thermostats, step controllers, contractors, etc., annually to determine items are in good condition and operating satisfactory. Adjust or repair as needed to provide proper operation.

(8) Heating System (Forced Warm Air). Prior to the heating season, preferably during summer months, the heating unit shall have a complete check up and cleaning by a qualified oil burner service company. The oil burner shall be adjusted for proper combustion, electrode setting checked, firing rate and nozzle angle noted, draft regulation adjusted for proper draft over the fire and at the breeching, condition of the combustion chamber noted, stack, fan and limit switches checked, fuel oil filter cleaned or replaced. A complete combustion and efficiency test shall be performed and all data recorded for record. Combustion Test Data Sheet shall be used. Check and oil forced-air-fan and motor. Clean fan blades as needed. Check fan belt tension, tighten same and/or replace same if necessary. Clean or replace air filters as necessary. Check thermostat for satisfactory operation and general condition. Inspect chimney flue, clean out debris as necessary.

(9) Boilers, Steam and Hot Water. At the end of the heating season drain and flush boiler and refill. Prior to the heating season, preferably during the summer months, the heating unit shall have a check up and cleaning by a qualified oil burner service company. This shall include a complete cleaning of the boiler and oil burner. The oil burner shall be adjusted for proper combustion, electrode setting checked, firing rate and nozzle angle noted, draft regulation adjusted for proper draft over the fire and at the breeching, condition of the combustion chamber noted, stack, pressure and high limit operating controls checked, fuel oil filter cleaned or replaced. A complete combustion and efficiency test shall be performed and all data recorded for record. Combustion Test Data Sheet shall be used. Check condensate pump and control. Check hot water circulator pump and circulator control. Check hot water circulator pump oil sump and oil as required. Check thermostat for satisfactory operation and general condition. Inspect chimney flue, clean out debris as necessary.

c. Telephone and Radio Equipment -Dam. (1) Exterior Telephone Equipment. Observe condition of poles, insulators, pins, hardware, cable messengers, telephone cables and wires, terminal boxes, protectors, etc. Report unsatisfactory condition to Utility Company.

(2) Radio Equipment. During normal project use, observe that equipment is functioning properly. Check condition of antenna and report any required repairs as necessary. Observe conditions of lead-in conductors; report any damage as necessary. See that components of both emergency generator and normal power supply are in good condition. Check condition of remote units, recorders, tone relays, telemarks, etc., for good condition.

d. Mount Wachusett Relay Station.

The relay station is maintained by the project manager. This station consists of one building with three rooms, one with radio equipment, one with emergency generator and one with METS equipment and related antenna and supports.

Emergency generator and building shall have proper maintenance and antenna shall be checked for damage from storms or vandalism.

Radio equipment, cables and antenna shall be maintained by electronic technicians from Operations Division. METS equipment is maintained by Motorola under a 5 year contract ending August 1974.

CHAPTER 5 - ROADS, GROUNDS AND RECREATION AREAS

* a. Roads, Parking Areas, Trails and Walks. (1) Continuous visual inspection for irregularities such as slides, settlement, rutting, potholes, washouts, pumping; damage to signs, guard rails, abutments, retaining walls, culverts and other hazardous conditions. Hazardous conditions shall be corrected immediately. During or following heavy rains or storms, inspect for flooding, washouts, settlement, slides, fallen trees and other obstructions.

(2) Pavements. Visually inspect all pavements annually to determine the need for repairs to expansion joints, cracked or broken sections, settlement due to failure of subbase or subgrade material, drainage or subgrade, scaling, spalling, abrasions, raveling at edges of flexible pavements, potholes, rutting, shoving, bleeding, weathering surface drainage, wash boarding and excessive amounts of dust. Perform all seasonal maintenance operations, to extent of available equipment and personnel, such as cold patch repairs, crack and joint filling, etc., at the proper time and according to the best practices in the area for maximum benefits. Roads will be resurfaced and/or sealed with the type of surface originally constructed; Operations Division to be notified through Basin Manager of pavements requiring reconstruction, repair or sealing.

(3) Shoulders and Roadside. Inspect annually all shoulders and roadside for drop-offs from pavements, rutting at pavement edge, proper slope for drainage, proper width, stability, slides, gullying, and obstruction to vision. Shoulders must be maintained with a smooth surface flush with adjoining pavement and to correct slope, width, and section. Keep shoulders and roadside clear of tall weeds and brush. Preserve and plant grass where it assists in preventing soil erosion. Plant sod, shrubs or vines when grass seed will not grow on eroding slopes.

(4) Walks, Roads and Parking Areas. All gravel and dirt access roads and parking areas in the dam and recreation areas will be maintained in good condition and repair throughout the season. Calcium chloride or other dust retarding agents will be used when prolonged dry weather creates a safety hazard. Bumpers of concrete, stone or wood will be provided in and around the outer edges of parking areas for uniform alignment of and to exclude vehicles from blocking emergency exits or trespassing on grassed areas. Rules and regulations are to be conspicuously posted off parking areas.

(5) Paths and Trails. Throughout the recreation area and reservoir continuing inspection shall determine the brush and trees which have to be removed. This is especially true after flood water impoundment.

* See Paragraph K below

Low hanging limbs and side brush must be removed. At project where trails are used during winter months, trail signs and small crossings should be inspected regularly.

* b. Traffic Services and Signs. (1) Traffic Services. Inspect traffic services annually for legibility, damage obstruction from view, signs and markers conforming to highway standards as to size and shape; automatic devices operating properly; guard rails, snow fences, and traffic control devices in good repair; road hazards properly marked by signs, lights, or devices and at proper distances from hazard; detours properly marked; traffic lanes plainly and properly marked.

(2) Signs. All rustic directional, warning and project identification signs in recreation areas shall be taken down at the close of the season, stained, lettering repainted, and insignia replaced if required. These signs will be stored under cover. The formula for the stain shall be 1 part burnt umber coloring, 2 parts turpentine and 10 parts boiled linseed oil. Standard highway type metal signs shall be removed and stored also. Replacements and additional signs or posts will be ordered before commencement of the recreation season through the Basin Manager. All wood sign posts in place are to be given a coat of stain, if weathered, before attaching signs. Permanent signs shall be repainted as required.

c. Drainage. Inspect semi-annually for adequacy of drainage systems; stoppage or catch basins, culverts, gutters, ditches, under drains; undermining of headwalls, foundations, road shoulders, abutments; ponding, gullying, and clogged drainage pipe. Existing drainage structures such as catch basins, manholes, ditches, gutters, drainage pipe, and flumes must be cleaned periodically in order that they may be kept free of debris and perform their designed function. As a minimum program, a complete inspection is made in the fall in preparation for the winter season and another in the spring, to determine extent of repairs required. Priority for accomplishing drainage maintenance shall be in accordance with established priorities.

d. Guard Rails and Fences. (1) Metal posts and rails and untreated wood posts will be painted all white. Creosoted wood posts will be stained. Decayed wood posts should be replaced and wire cable kept at the proper tension. Steel guard rail posts and rails shall be replaced when unserviceable and painted when required. Wood and metal guard rail and posts shall also be checked frequently and stained or painted when weathering is observed.

(2) Fences. Inspect annually to determine the need for repairs to gates, locks, and fencing. Fences and accessories shall be maintained to provide the maximum security for which they were designed. Repair all breaks as soon as they are discovered, replace unserviceable gate locks promptly. To maintain harmony with adjacent areas subject to public scrutiny, painting may be desirable.

(3) Chain link fencing will generally not require painting. If required due to excessive rusting, etc., the Basin Manager should be notified.

e. Grounds. (1) General. Visual inspection for loss or damage to vegetation, need for mowing, insect control, ponding, flooding, erosion, clogged or overgrown streams or drainage system, damaged fences, gates, trees, shrubs and vines.

(2) Improved/Grounds. Close inspection annually by experienced personnel for soil deficiencies, damaged trees, shrubs, erosion, and vegetation; need for topsoiling, reseeding, sodding; weed, dust and insect control; pruning, trimming, planting, and mulching. During or following storms, heavy rainfall, or drought make an inspection for flooding, downed trees, damaged trees, shrubs, vegetation and need of repairs. Improved grounds generally consist of lawns in vicinity of operators quarters and other buildings, all landscaped areas, and recreational areas and should be maintained in keeping with the use and intensity of such use.

a. Grassed areas, under normal conditions, should be mowed during the active growing season to a height of 1-1/2 to 2 inches. Mowing should be no more frequent than necessary to prevent the grass exceeding a height of 3 to 5 inches. Reseeding, weed control, fertilizing, and irrigating should be performed only when the appearance of the grass indicated a need for such treatment.

b. Shrubbery should be trimmed in accordance with the requirements of the species and as needed to present a suitable appearance.

c. Shade and ornamental trees. To avoid frequent re pruning, anticipate tree growth for two to three years and prune accordingly. Remove dead or broken branches or those that extend over buildings, and shape to present a suitable appearance.

(3) Semi-improved Grounds. Inspect annually to determine the need for mowing, reseeding, sodding, trimming, pruning, removal of brush and flammable vegetation from under and around wood structures, erosion and dust control; clearing of streams and drainage ditches, and application of fertilizers. Semi-improved grounds consist of roadsides, shoulders, open areas adjacent to lawns and similar areas and which require less attention than do improved grounds. These areas should be mowed with tractor-operated equipment to a height of 2 inches or more when the grass reaches a height of 5 to 7 inches or when excessive uneven growth of grass or weeds becomes unsightly. Reseeding and fertilizing is limited to kind and rate necessary to sustain vegetative cover for the control of erosion by wind and water. Drainage ditches, gutters, and channels should be cleaned of wooded plants, vegetation and other matter that restricts flow, at least once a year.

(4) Unimproved Grounds. Inspect annually to determine the need for erosion and dust control; clearing fire lanes, power and communication lines right-of-way; mowing of flammable vegetation. Unimproved grounds are areas that do not fall within categories above and require only minimum maintenance. Clear firebreaks and clean under and around wood structures, yearly. Anticipate tree growth for two to three years and remove branches overhanging buildings, roads, power and communication lines accordingly.

*f. Sanitary Facilities. Roof, exterior and interior are to be inspected regularly for deterioration and signs of vandalism. Major repairs and painting should be scheduled during periods when usage is at a minimum. All doors shall be checked to ascertain that they operate properly and that latches are in good working condition. Facilities will be kept scrupulously clean and all necessary accessories provided the visiting public. Fixtures in latrines shall be cleaned daily and odor suppressants added to pit latrine when required. All holding vaults or tanks should have solids removed and be properly flushed by a contractor specializing in septic tank service. It is mandatory that pit latrines, holding tanks or vaults be cleaned or pumped out at the end of each recreation season.

*g. Picnic Facilities. Picnic tables require periodic cleaning by washing with a detergent. Tables shall be treated to combat grease and similar type stains. Unserviceable table tops or seats shall be replaced. Wood tables not anchored will be placed on end during winter months. Brush and debris shall be removed on a regular basis. Poisonous plants shall be sprayed with approved weed or brush killer. Grilles, barbecues, and fireplaces shall be maintained in safe condition and shall be repaired when deterioration is evident. Units beyond repair are to be replaced. In dry season precautions will be taken to cope with fire hazard. Hazardous trees will be trimmed or removed. Aeration of soil should be accomplished in areas where ground has become compacted to a degree that it is injurious to trees. Picnic areas will be maintained in a clean and sanitary condition.

*h. Refuse Collection. (1) Visual inspection weekly during the active season to determine the police of area, frequency of collection, and condition of containers. Inspect area following severe storms of flooding to determine extent of damage, loss of containers, or existence of any health or safety hazards.

(2) Trash containers will require emptying and cleaning as frequently as the visitation load dictates. Paint containers inside and out as required and the letters PLEASE stenciled on, using white paint. During the off season, the barrels are to be inverted when stored outdoors.

i. Insect and Rodent Control. Visual inspection to detect breeding places where treatment will be most effective, such as ponds, swamps, and thick tall vegetation. The nature and degree of insect and rodent control will be sufficient to meet requirements of State and/or local health agencies. The extent and intensity of larviciding will be frequent enough to maintain a level of *Anopheles quadrimaculatus* below the level determined acceptable by the State health agency. Drift should be piled and removed during draw-downs for more effective mosquito control areas. Intense public use may require spraying to control insects in picnic areas. The application of chemicals will be confined to refuse collection points and around toilets but not on picnic tables where food could be contaminated. Poison to control rodents will be used in a manner that will not permit harm to public.

j. Omitted.

k. State of Massachusetts Division of Fisheries and Game. The entire recreation area to extent covered in management plan is under license agreement to the state for fish and wildlife habitat improvement and facility maintenance.

l. Snow Removal. During winter months all access roads designated by Project Manager shall be kept plowed and sanded. Provide stakes where necessary (in full) to outline limits of roadways and parking areas to avoid damage to areas and structures beyond limits of pavement.

m. Removal of Dead and Down Timber. The reservoir area, particularly in the lower levels, will be kept cleared of all down and dead timber. This may be disposed of by chipping the slash and the timber which is of no value; it may be cut into four-foot lengths and used by the Project Manager or, if any merchantable or salable quantities are available, it will be sold by the Supply Division of the Division Office. Chips may be spread as a mulch on slopes above spillway level.

n. Cutting of Wood by Others. All standing timber in the reservoir area, as well as other natural resources, is Government property. Therefore the Project Manager is not authorized to permit any person or persons to cut and/or remove any standing timber from the reservoir area or to countenance such removal. Persons desiring to cut wood should be advised to write to the Division Engineer, furnishing details of his proposal, including the information on the size, species, quantity, location, etc., together with an offer.

CHAPTER 6 - ELECTRICAL AND MECHANICAL EQUIPMENT

a. Gates. Electrically operated Sluice Gates.

(1) Weekly. When and as conditions allow, each gate shall be tested for satisfactory operation.

(2) Quarterly. Thoroughly lubricate gates and screwed hoists. Lubricate bearing and gears as required. Check gate position against gate hoist indicators.

(3) Annually. Check each gate when fully closed for leakage and proper sealing. During operation of the gate hoists, check bearings, wear on gear teeth. Check limit switch and torque switch contacts for cleanliness, pitting, and corrosion. Check the closing limit switches setting. Check seals on all gates, clean and replace damaged seals and other items if necessary. All rusted metal on the gates shall be thoroughly wire-brushed and spot painted. Operate each gate manually for a distance of one foot in each direction.

(4) Motor Operated Hoist Operations. Annually. Electric motors shall be oiled once each year, or more often if required by the manufacturer's recommendations. The end bearings and the worm in the limit switches shall be oiled with a few drops of S.A.E. 20-W oil.

(5) The gate stems should be coated with molykote grease Type G to prevent rust.

(6) Observe if there is any vibration during raising or lowering of gate in water.

b. Generators and Motors. (1) Generator and Motor Foundations, Bases or Supports. When making an operational tour, observe for any unusual conditions. For generators, integral horsepower motors and engines, inspect for cracks or other damage. Inspect anchor bolts for indications of looseness. Observe for signs of loosening or damage to dowel pins (if provided). Tighten or repair as necessary.

(2) Standby-Unit. Operational. (a) Weekly. Each standby-unit shall be operated for a reasonable period each week to bring engine to operating temperature. Before and after each weekly run, the level of the water in the radiator and the oil in the crankcase shall be checked. After each run, the exhaust piping shall be drained of condensate. The weekly testing of equipment shall be done while the standby unit is being operated, with the standby unit furnishing all the energy. Before, during and after the weekly test operation, operation data will be recorded on Standby Electric Generator Unit Location Form. Any malfunction of the unit shall be repaired if possible by the project manager, and reported to the Basin Manager if it can not be repaired. The crankcase oil shall be changed every 100 hours of operation or every six months, whichever is sooner and when the oil is at operating temperature so that complete drainage will result. Replace the oil filter element every other oil change.

(b) Monthly. Once a month the standby unit operational run shall be extended to 2 hours. Carefully inspect the storage battery, air cleaner, oil filter, fuel pump and service according to instructions furnished by the engine manufacturer. Operational data will be reported on Standby Electric Generator Location Form.

(c) Monthly. Operational Test. Inspect commutator, collector rings and brushes for satisfactory operation. Observe brushes to determine if replacement is required. Inspect condition of commutator and collector rings, polish if grooved or rough. Commutators and collector rings with a good surface and polish should not be disturbed. Wipe commutator and collector rings with canvas.

(d) Antifreeze no longer required draining at the end of each cold weather season; it may be retained in the cooling system for an extended period dependent on the outcome of a hydrometer test accomplished during performance of scheduled Preventative Maintenance Service on the engine.

(e) Annually. Clean the slip rings and commutator and blow out same with dry compressed air.

(3) Brush Rigging. Annually. Inspect the brush rigging and tighten bolts, screws and connections. Check brush spring tension and brush fit. Replace brushed as necessary.

(4) Motors, Fractional Horsepower. Fractional horsepower motors will be given periodic visual inspection as scheduled by the Project Manager. Attachment bolts or screws tightened. Motors lubricated in accordance with project lubricating schedule. Clean external surfaces, check motor couplings, pulleys, and belts, tighten or replace as required.

c. Electrical Equipment. (1) Primary Equipment and Cables. No attempt at maintenance of the primary equipment, cables, and transformers shall be made by operating personnel. A visual inspection shall be made and any maintenance or repairs required shall be reported to the Utility Company and the Basin Manager.

(2) All maintenance in connection with the following items will be performed by personnel from Operations Division.

(a) Switchboard Wiring and Generator. Annually. Check switchboard, secondary wiring and generator cables. Check all lugs and connections for tightness. Check ground connections for continuity. Perform insulation tests on all circuits, motors and generator windings.

(b) Knife Switches. 2 Years. Examine for evidence of heating; see that hinges and contacts are in order and that interlocks, if provided, are in good condition. Repair or replace as needed.

(c) Motor Starters. 2 Years. Examine starters for condition. Repair and replace parts necessary to place starter in good operating condition. Check auxiliary contacts and interlocks for proper operation. Check motor control devices for satisfactory operation.

(d) Control Cables (Including single conductor control wiring). Examine monthly exposed sections of cables for signs of overheating, corrosion or other damage to insulation or sheath, supports, and terminations.

(3) Storage Batteries. Monthly. Check for leaking battery cases. Check and record specific gravity of all cells. (Note condition by hydrometer, replace if required). Clean corrosion products from intercell connectors and terminals. Add distilled water as needed. Coat connections with a film of battery terminal grease. Follow battery manufacturer's instructions for giving batteries an equalizing charge.

(4) Lighting (as required). (a) Replace burned out lamps. Replace flashing fluorescent lamps as soon as possible. Continuous flashing may damage the ballasts.

(b) Replace Broken parts

(c) Clean reflectors and lenses.

(d) Replace defective switches.

(5) Switchboard and Panels (Annually).

(a) Check all fuses. Keep spare fuses on hand. Locate and correct source of trouble before replacing fuses. Use Proper rated fuse. A higher rated fuse will not protect circuit. Do not insert fuse on live circuit because it may arc and cause a poor contact and blow fuse. Make sure fuses are tight with good contact.

(b) Check breakers for operation.

(c) All connections should be tight. Check all bolts, screws and clamp and tighten if loose.

(6) Readings (Semi-Annually).

(a) Check voltage. Voltage that is too high or too low will affect the life, efficiency and economy of equipment.

- (b) Check motor currents observed with nameplate ratings.
- (c) Check frequency.
- (d) Meggar all feeders and circuits (by Personnel from Operations Division).
- (e) Meggar all generator and motor windings (by Personnel from Operations Division).
- (7) Interlocks (Annually).
 - (a) Check interlocks for proper operation.
 - (b) Check padlocks and locks on electrical enclosures.
- (8) Rubber Mat. Maintain a clean rubber mat in front of switchboard.
- (9) Lightning Protection (Annually).
 - (a) Check continuity of ground wires.
 - (b) Check flagpole ground.
 - (c) Check arrester grounds.
 - (d) Check antenna mast ground.
 - (e) Check switchboard ground.
 - (f) Ground wires exposed to mechanical injury should be protected by conduit.
- (10) Receptacles (Annually).
 - (a) Replace defective units.
 - (b) Check ground continuity on grounding type.
- (11) Portable Cords.
 - (a) Arrange cords so that electrical connection bears no mechanical strain.
 - (b) Protect all lamps used with an extension cord with a lamp guard.

(c) Check for proper support.

(12) Wiring.

(a) Check for proper support.

(b) Check insulation for deterioration caused by age, abrasion, moisture, oil, heat or other causes.

(13) Neutral. Check neutral ground on supply. This ground is usually connected to a metallic water piping system on the street side of any meter which could interrupt the continuity of the metallic circuit to ground. Check connections for tightness.

d. Sumps and Sump Pumps. Check area drains into sumps, floats, switches and motors for proper operation quarterly. Repair pumps and accessories as conditions or performance indicate. Clean area drains, drainage system, and sumps as necessary.

CHAPTER 7 - FIRE PREVENTION

a. General. All fire fighting equipment must be kept in instant readiness for operation at all times. At least four fire rakes will be kept in a place readily accessible.

(1) During times when there is a danger of forest fires, the Project Manager shall be on the alert for fires in the reservoir. He shall be familiar with all sources of water in the reservoir area and during the dry season shall have up-to-date information as to the availability of water. In areas distant from the river, water holes in low areas will be developed to provide a supply. Existing water holes shall be water holes for purposes of safety.

(2) The dam is provided with a portable fire pump with a complement of accessories and 1-1/2" hose. Observe pump and associated equipment weekly for general condition. This pump shall be assembled with its accessories once a month (except during the freezing weather) and run for a short time. Chapter 1 includes a list of the equipment to be included with the portable fire pumps. All of the equipment given in the list shall be kept in one place and ready for instant use at all times. It must be borne in mind that when this equipment is needed, the personnel sent to get it will be excited and hurried, and unless all the equipment is grouped in one place, some important item may be overlooked resulting in serious delay.

b. Extinguishers.

(1) Carbon Dioxide (CO₂) Extinguishers.

Monthly. Visual inspection for proper location and condition. Check seals.

Semi-Annually. Weigh units and recharge if weight is more than 10 percent less than normal. See paragraph c (1) for test.

(2) Dry Chemical Extinguishers.

Monthly. Visual inspection for proper location and condition of extinguisher.

Semi-Annually. Inspect chemical for condition. Weigh cartridges to determine charge. Repair and refill as required. See Paragraph c (2) for test.

c. Testing Extinguishers.

(1) Carbon Dioxide (CO₂) Extinguishers. Perform Hydrostatic cylinder test in accordance with Interstate Commerce Commission (ICC) test procedure:

(a) When emptied by use, if time elapsed since last test exceeds five years, or

(b) When time elapsed since last test exceeds twelve years, or

(c) When corrosion, damage or the like warrant regardless of time elapsed.

(2) Dry Chemical Extinguishers. Return to manufacturer for inspection and test:

(a) Every five years, or

(b) When corrosion, damage or the like warrant regardless of time elapsed.

d. Fire Hose.

Monthly. Visual inspection monthly of nozzels and connections. See that the hose is hung in proper position and place for use in case of fire.

Annually. Test all hose annually except unlined linen hose at system pressure. Defective hose will be replaced with new hose.

5 Years. Test unlined linen hose every five years at 25 pounds higher than normal system pressure.

e. Nozzles and Playpipes. Visual inspection monthly for condition. See that equipment is kept in the proper place for ready use. Repair or replace as needed.

f. Fire Doors. Inspect and manually operate monthly to insure equipment is in good operating condition.

g. Flammable Waste Containers. Observe that containers are in the proper locations; that proper type containers are being used and are in good condition. Observe that lids fit securely. Be sure that flammable waste is properly disposed of.

h. Fire Warning Signs. Observe that adequate warning signs are properly located. Check signs for good condition.

i. Fire Plan and Emergency Instructions. Observe adequacy of posted fire and emergency instructions monthly. Check adequacy, condition and current status annually. Revise as required.

j. Fire Water Storage Tanks.

Monthly. Observe for water level. See that access is clear.

Annually. During cold weather check for freezing.

Not Scheduled. After snow, icing or other unusual condition, inspect water storage tank to see that it can be satisfactorily operated if needed.

CHAPTER 8 - ENVIRONMENTAL PROTECTION

a. Scope. The Project Manager shall perform his operating and maintenance work in such a manner so as to prevent, to the extent practicable, environmental pollution as the result of Government activities as well as activities by others on the Government property. For the purpose of this manual, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, and land, and involves noise and solid waste-management, as well as other pollutants.

b. Regulations. In order to prevent, and to provide for abatement and control of, any environmental pollution arising from the activities of the Government personnel and others on the reservoir, the Project Manager shall make sure that all people using or working at the project comply with all applicable Federal, State and local laws, and regulations concerning environmental pollution control and abatement, and all applicable provisions of the Corps of Engineers Manual, EM 385-1-1, entitled "General Safety Requirements," latest issue in effect.

c. Air Pollution. Some forms of air pollution control are covered in other chapters such as dust control and maintenance of rocks and herbicides and insecticides. Further, EM 385-1-1, "Safety - General Safety Requirements" requires control of air pollution wherever it is a safety and health hazard. Air pollution originating and caused by project operations shall be eliminated or decreased. The Project Manager shall comply with project air pollution standards set forth by Federal, State and local agencies.

d. Water Pollution. Care shall be exercised not to pollute the rivers and to maintain water quality standards. Major sources of water pollution are wastes from floating plant (fuel, oil, grease), herbicides and insecticides, sanitary and other waste disposal from buildings, shops and storage areas, and spillage of fuel, grease, oil, etc.

e. Land Despoilment. Of all forms of despoilment by land equipment, landscape defacement is the most permanent. When a tree is removed needlessly or damaged by burning waste too close to it, repair or replacement takes years. When a fill of the earth, gravel, sand, etc. is made in the wrong place, the environment may be marred for the life of the project. Common land despoilment actions include destruction of land forms and vegetation and pollution of the land by spillage and waste. Outside of recreation and similar areas, care shall be exercised in controlling public travel or usage.

f. Noise Pollution. This area of pollution includes a wide range of causes, from faulty mufflers on equipment to use of explosives. Noise pollution is most serious in congested areas and in enclosed operations. The Project Manager shall make every effort to reduce and control generation of noise detrimental to human environment due to Government activities including control due to a variety of noise producing operation and maintenance machinery and activities.

CHAPTER 9 - MISCELLANEOUS

a. Mobile Equipment, Tools, etc. (1) General. The maintenance and operation of a flood control dam requires a substantial amount of property, tools, and equipment. It is the policy of the New England Division to provide the head Project Manager with sufficient tools and equipment to properly maintain and operate the dam, related structures and reservoir with a maximum of efficiency. The Project Manager must bear in mind that the more tools and equipment they acquire the greater their capability of maintenance.

(2) Government-Owned Miscellaneous Small Gasoline Powered Plant. Test operate each engine weekly. Check general condition of unit during the test operation and repair any deficiencies noted.

Each engine will be given a thorough check bi-annually by a competent mechanic. Replace excessively worn parts and repair as necessary.

Check oil, water, and fuel before and after each use. After each use clean and service the unit so that it is ready for the next operation.

On small miscellaneous plant that is seasonal in use, the engines will be drained, cleaned, and properly lubricated for storage during the non-use season. Batteries, if any, for such plant will be placed on a trickle charger, and their condition checked each month.

(3) Miscellaneous Tools. All items should be kept clean and in good working order at all times. Tools with an edge should be kept sharp. Broken handles on axes, shovels, hammers, etc., should be promptly replaced.

b. Motor Vehicle Maintenance. (1) Preventative maintenance on motor vehicles under the jurisdiction of the Project Manager. Maintain equipment as recommended by vehicle manufacturer and as outlined in subparagraph (2) below:

(2) Periodic Motor Vehicle Maintenance Guide. This guide will be used as the equipment requires and in conjunction with the Operator's Manual from the manufacturers.

I. Weekly

Check

Radiator for fluid level and leaks

Fan belts for tension and wear

Batteries for water level

Engine Oil

Transmission oil if applicable

Tires for pressure and abrasions

Fuel - keep fuel tank full

II. Monthly

1. Check

Weekly items

Exhaust system for leaks

Power steering oil level

Windshield wipers for wear and fluid level.

Brake fluid level

Horn and all lights

Hydraulic fluid level

2. Service

Grease fittings

Air cleaner - check for dirt

Vacuum interior

Wash exterior

III. Yearly

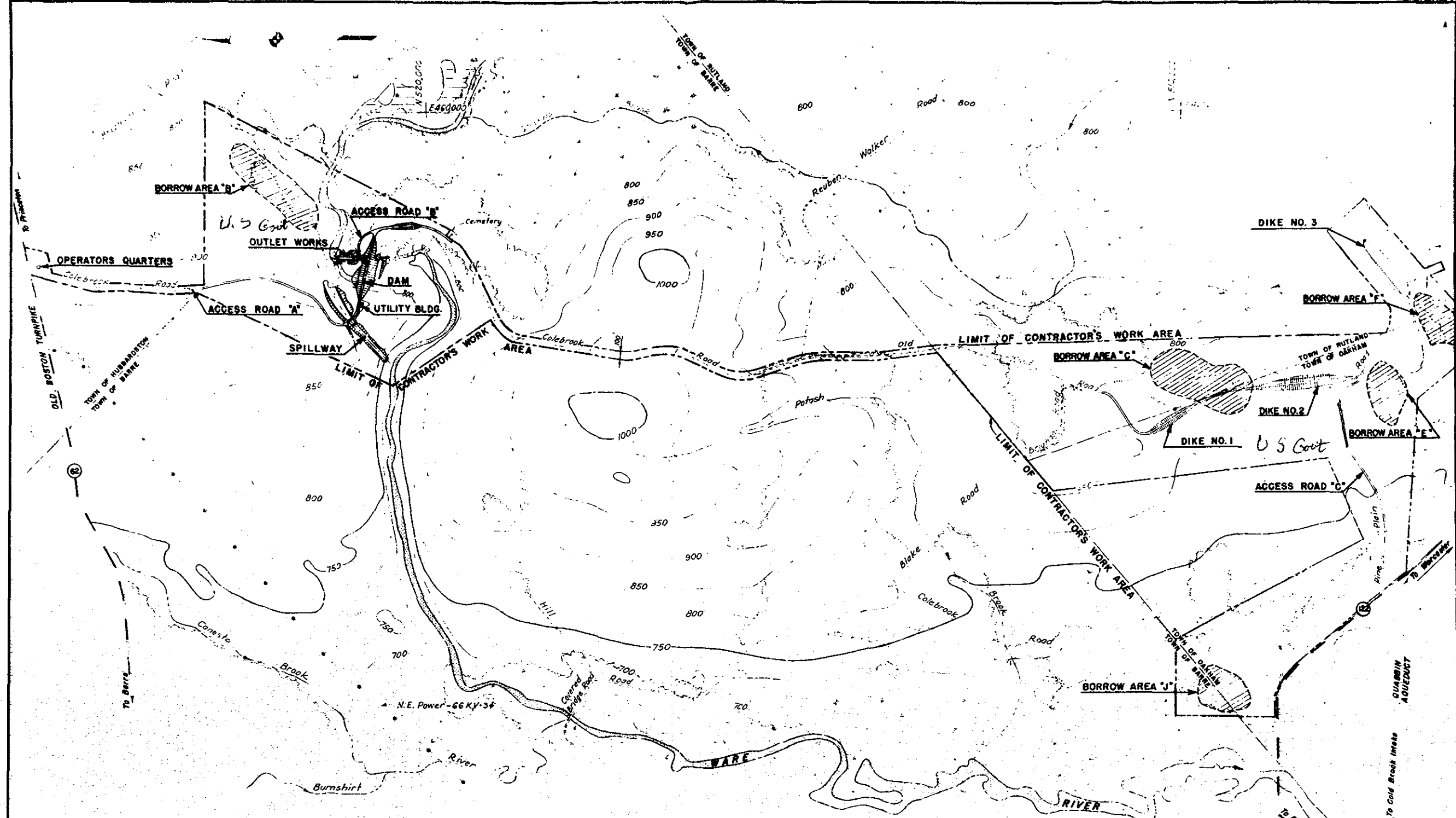
1. Clean polish and wax exterior painted surfaces

2. Remove all rust spots and paint.

c. Maintenance Records. Maintenance records shall be kept on Card Form #314 as required in Engineer Regulation ER 58-2-1, Appendix 11, dated 31 May 1968.

d. Snow Shoes. After the winter period, snow shoes should be wiped clean, the wood and webbing varnished with high grade spar varnish, and stored. Two thin coats of varnish are preferable to one thick one. The shoes should be tied securely, back to back, and a block of wood forced into the space between the toes. They should be placed out of the sun and suspended by a wire so that mice or squirrels cannot get at them.

e. Oil Storage Tanks. Drain condensate from all oil and fuel storage tanks at least once every two years. Clean above ground tanks and repaint as required. Check liquid level devices for satisfactory operation. Check gage glasses for leaks. Above ground tanks must be diked.



EXPLANATION OF SECTION DESIGNATION

A section shown on the same sheet on which it is cut is designated by letter only.
 A section shown on a sheet other than that on which it is cut is designated by a fraction. The numerator of the fraction is the section reference and the denominator is the sheet numbers on which the section is either cut or shown.

EXAMPLE

Section A is cut on Sheet No. 3 and the section is actually shown on Sheet No. 4. On Sheet No. 3 the section designation is $\frac{A}{4}$ and on Sheet No. 4 is $\frac{A}{3}$.

LEGEND

- — — State Highways
- — — Existing gravel or dirt roads.
- — — Limit of contractor's work area.
- — — Limits of wooded area
- — — Limits of borrow areas

NOTES

Contour interval, 50 feet.
 Elevations refer to Mean Sea Level.
 Datum.
 Grid system based on Mass. State Plane Coordinates.
 Show lines of 5' and 10' contours.

Record
 Contract No. 18-416-56-1354

SCALE 1" = 500'
 500' 2 500' 1000'

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS
 U.S. ARMY
 OFFICE OF THE DIVISION ENGINEER
 NEW ENGLAND DIVISION, BOSTON, MASS.

**CONNECTICUT RIVER FLOOD CONTROL
 BARRE FALLS DAM**

GENERAL PLAN

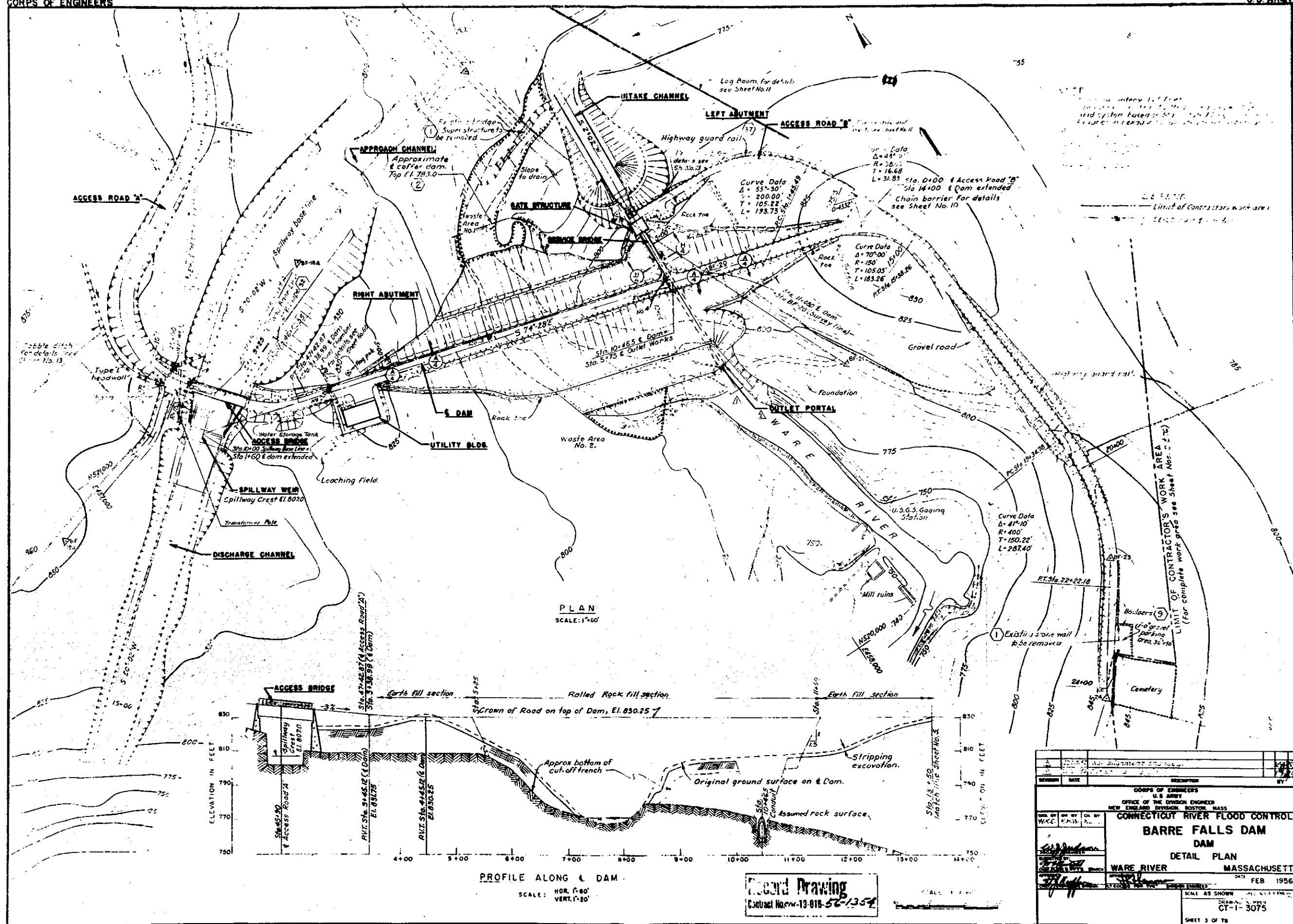
WARE RIVER MASSACHUSETTS

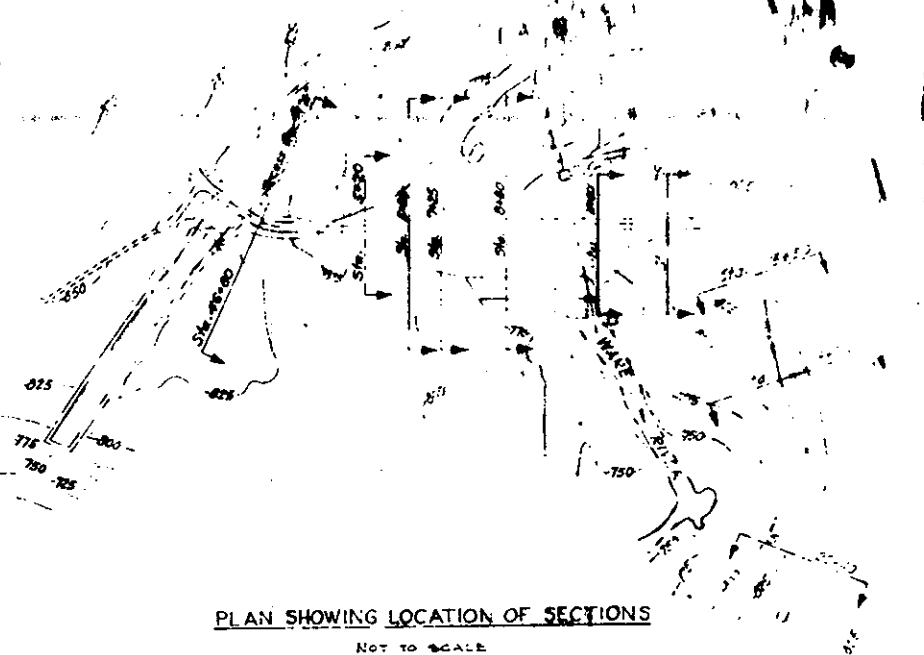
DATE FEB 1956

SCALE 1" = 500' SHEET NO. 1 OF 2

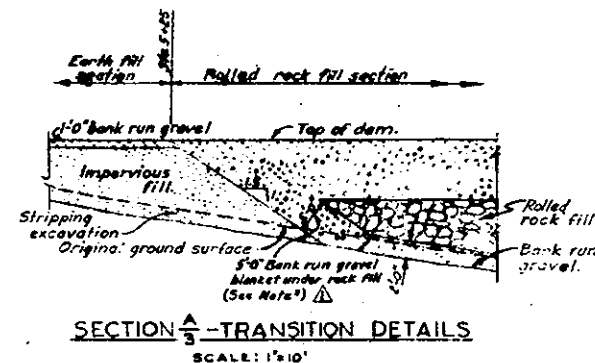
DRAWING NUMBER
 CT-1-3074

SHEET 2 OF 2

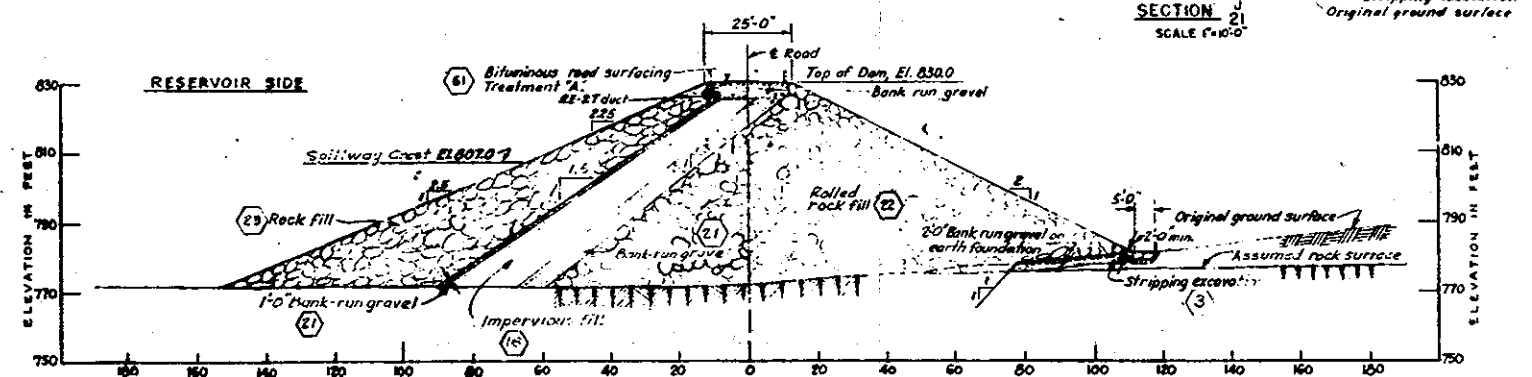




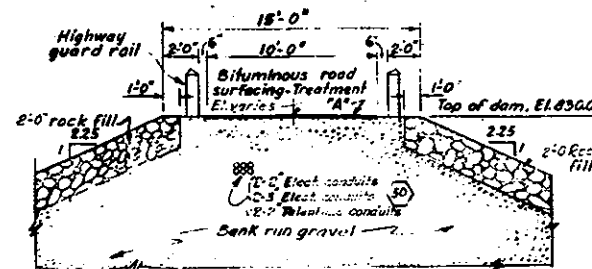
PLAN SHOWING LOCATION OF SECTIONS
NOT TO SCALE



SECTION AT ACCESS ROAD "A" STA. 46+80
TYPICAL FROM STA. 46+50± TO ACCESS ROAD "A"
TO STA. 4+20± E OF R/W
SCALE 1" = 10'



SECTION AT STA. 5+20
TYPICAL FROM STA 4+70 TO STA 5+25±
SCALE: 1"=10'
TRANSITION DETAILS SHOWN ON THIS SHEET



SECTION AT STA. 6+50
TYPICAL FROM STA. 5+25 TO STA. 6+80 ± (SEE NOTE # ON SHEET NO. 3)
SCALE: 1"=20'

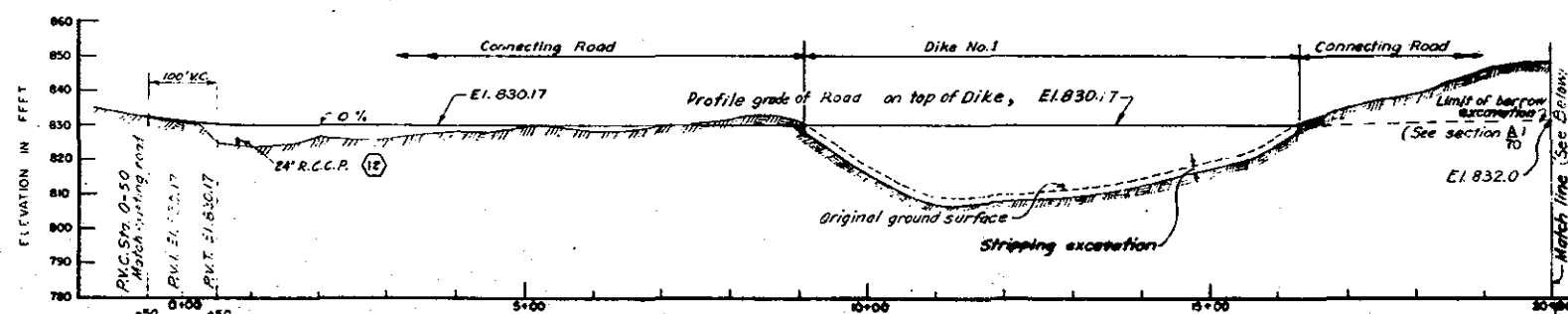
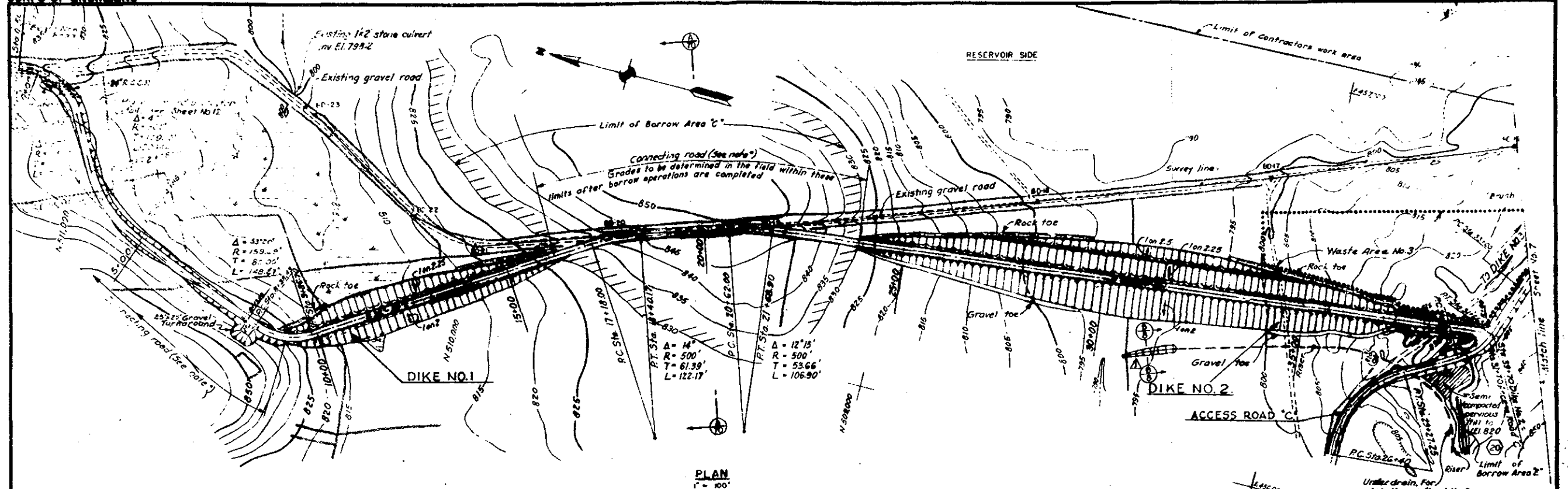
SECTION $\frac{H}{3 \times 2}$
SCALE: 1" = 4'

NOTES:

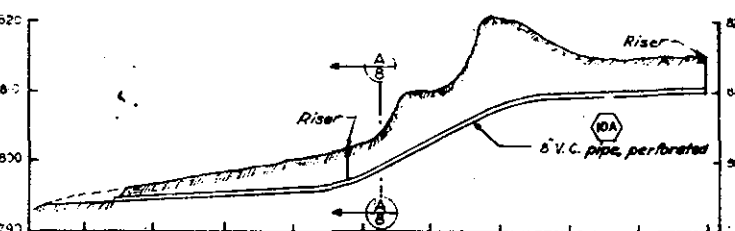
Elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers
under which payment will be made.
Electrical duct work, handholes, electrical & telephone
conduits and cables shown on this sheet will be paid
for under Item 50
5'-6" Gravel blanket also to be provided between impervious
material of Earth Fill Section and rock in upstream portion
of Rolled Rock Fill Section of Dam.

Record Keeping
Contact No. 000-15-018-54-1353

1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43		44		45		46		47		48		49		50		51		52		53		54		55		56		57		58		59		60		61		62		63		64		65		66		67		68		69		70		71		72		73		74		75		76		77		78		79		80		81		82		83		84		85		86		87		88		89		90		91		92		93		94		95		96		97		98		99		100	
1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16		17		18		19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39		40		41		42		43																																																																																																																			



PROFILE ON & DIKE NO. 1 AND CONNECTING ROADS

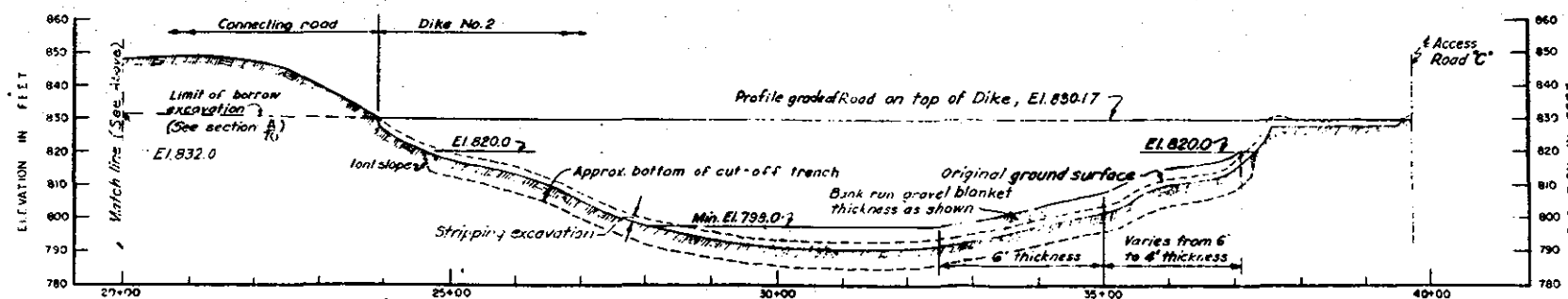
SCALE: HOR. 1" = 100'
VERT. 1" = 20'

PROFILE ALONG UNDER DRAIN-DIKE NO. 2

SCALE: HOR. 1" = 100'
VERT. 1" = 10'

NOTES:

- For general notes applying to this sheet see Sheet No. 3
- For typical section of connecting roads see Sheet No. 12
- For details of under drains see Sheet No. 8
- Grid system based on Mass State Plane Co-ordinates

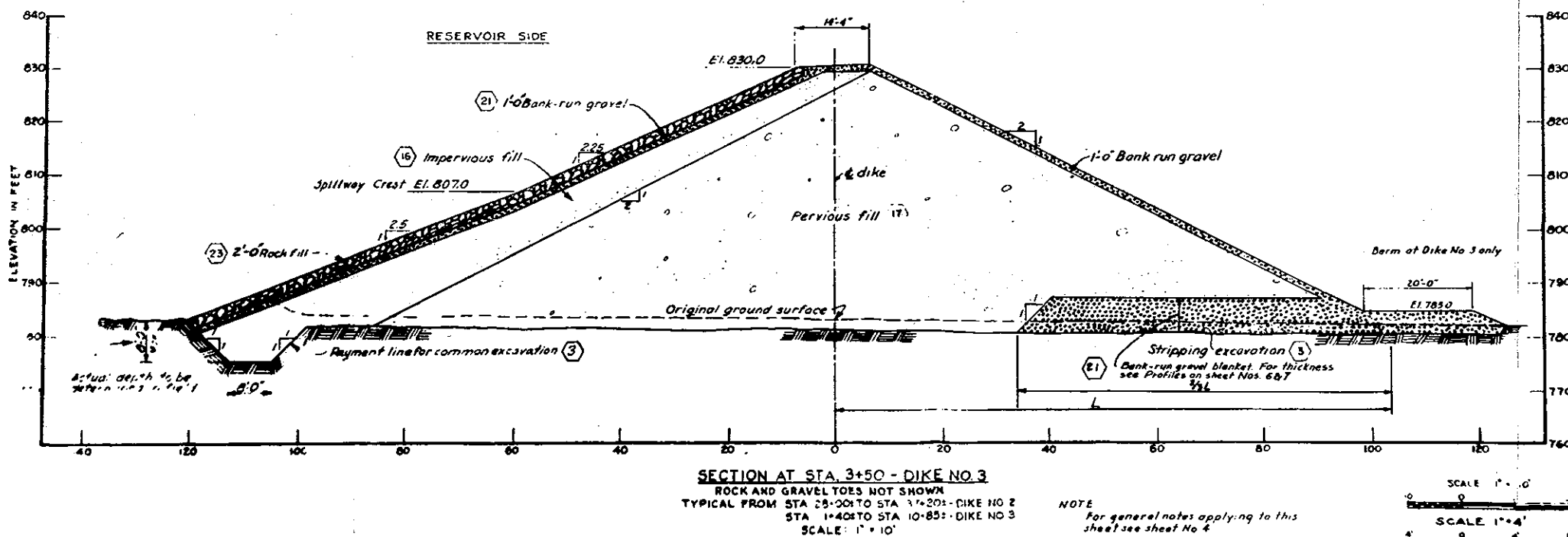
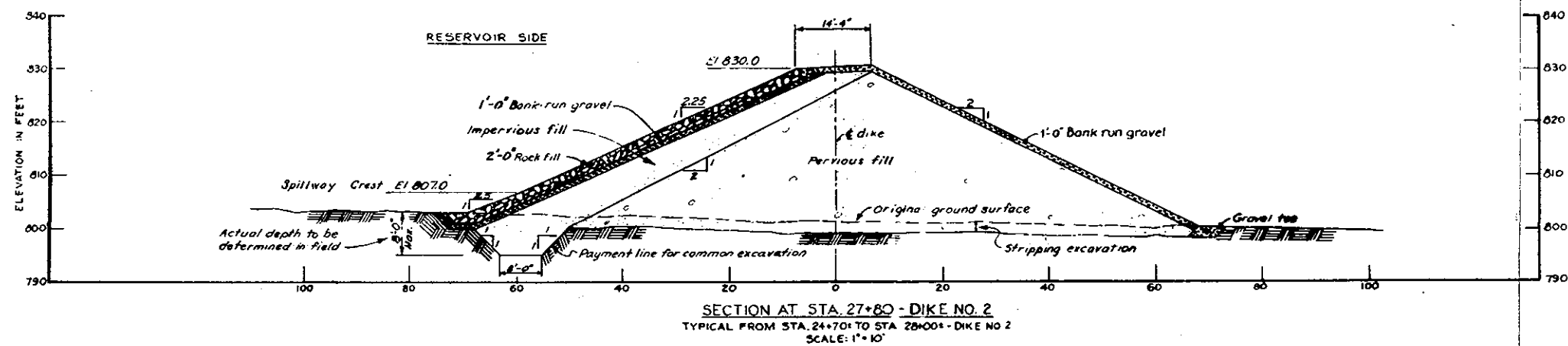
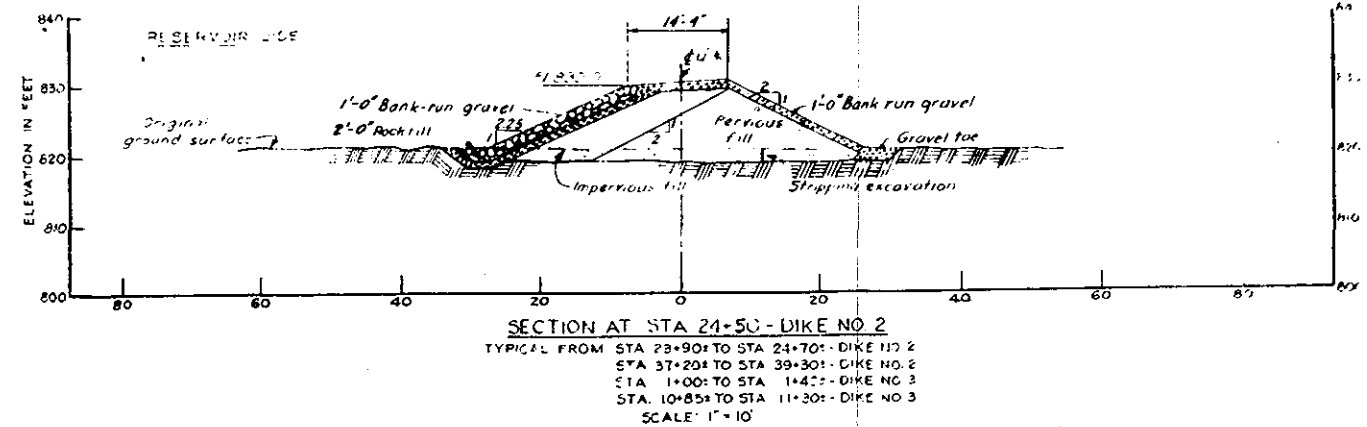
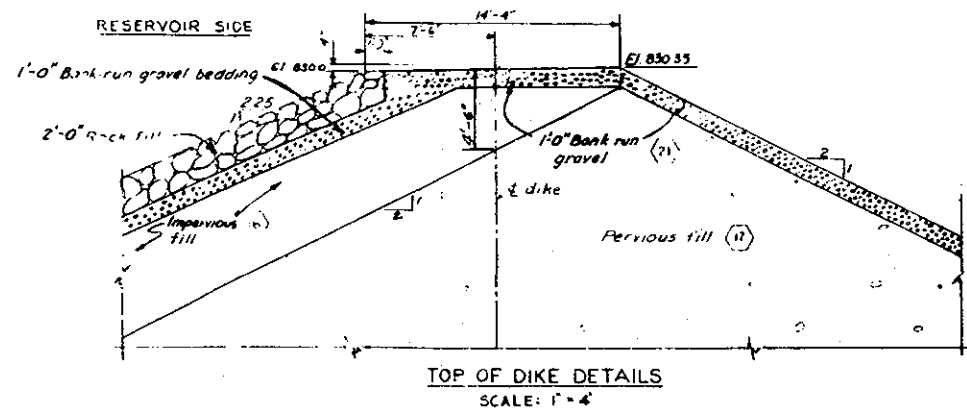


PROFILE ON & DIKE NO. 2 AND CONNECTING ROAD

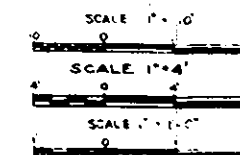
SCALE: HOR. 1" = 100'
VERT. 1" = 20'

1031 Drawing
Contract No. CW-13-616-52-1354

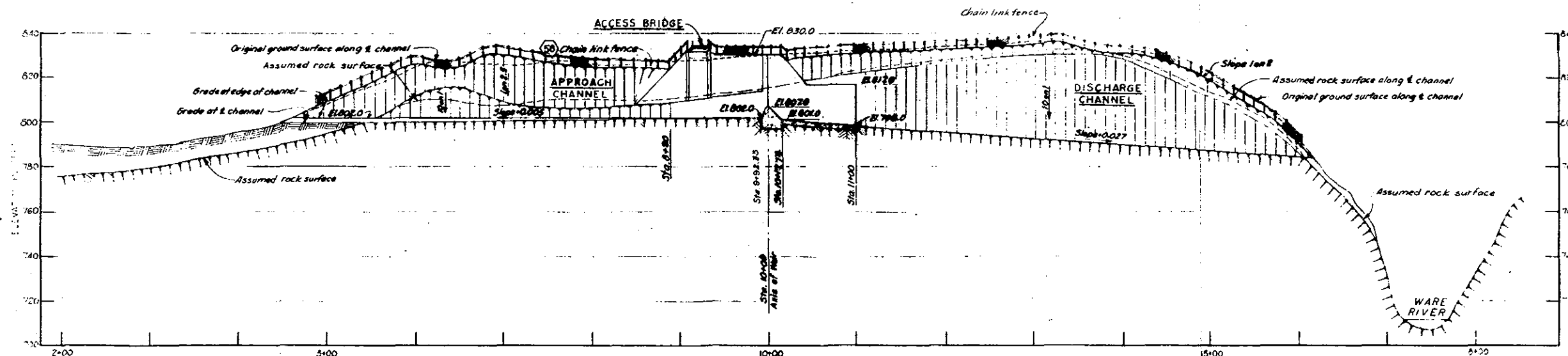
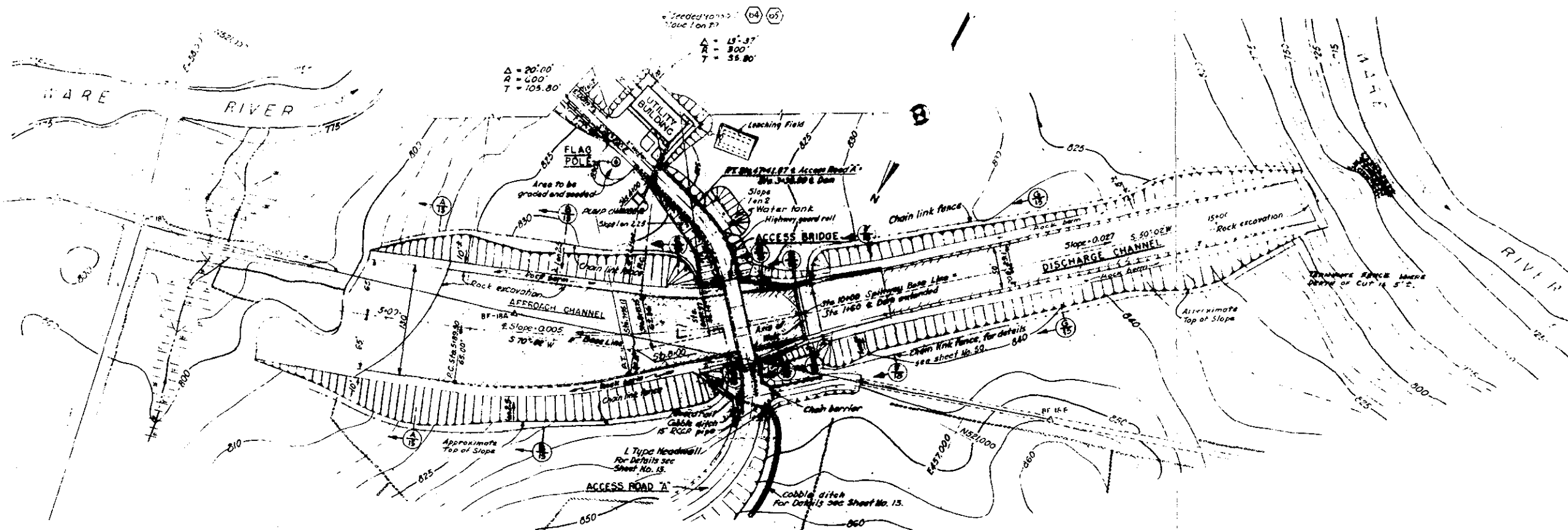
6-10-60 Final field corrections		15.00
6-10-60 Section Indication added (Add 3)		15.00
<p>OFFICE OF THE CHIEF ENGINEER CONNECTICUT RIVER FLOOD CONTROL BARRE FALLS DAM DIKES PLAN AND PROFILE NO. 1 MASSACHUSETTS FEB. 1964</p>		
<p>SCALE: 1" = 100'</p>		<p>DESIGNED BY: [Signature] CHECKED BY: [Signature] DRAWN BY: [Signature] DATE: FEB. 1964</p>
<p>SHEET 6 OF 10</p>		<p>CT-1-3076</p>



NOTE
For general notes applying to this sheet see sheet No. 4



REVISION		DATE	DESCRIPTION
		6-10-60	Final Field Corrections
CORPS OF ENGINEERS U. S. ARMY OFFICE OF THE DISTRICT ENGINEER NEW ENGLAND DIVISION BOSTON, MASS.			
DES. BY W. D. A.		CH. BY W. D. A.	DATE JAN 1961
CHECKED BY W. D. A.		DRAWN BY W. D. A.	
PROJECT CONNECTICUT RIVER FLOOD CONTROL		SHEET NO. 304	
LOCATION WARE RIVER		STATE MASSACHUSETTS	
SCALE AS SHOWN ON SHEET NO. 303		SHEET NO. 304	



PROFILE ALONG SPILLWAY CHANNEL
SCALE: HOR. 1" = 50'
VERT. 1" = 20'

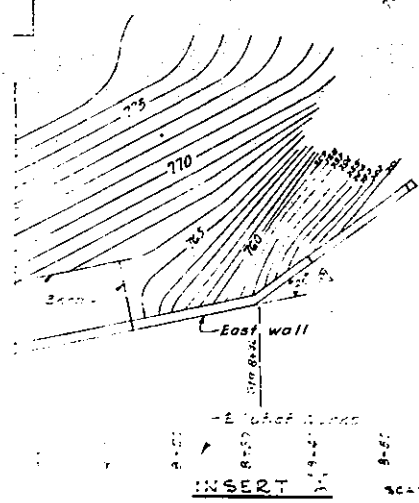
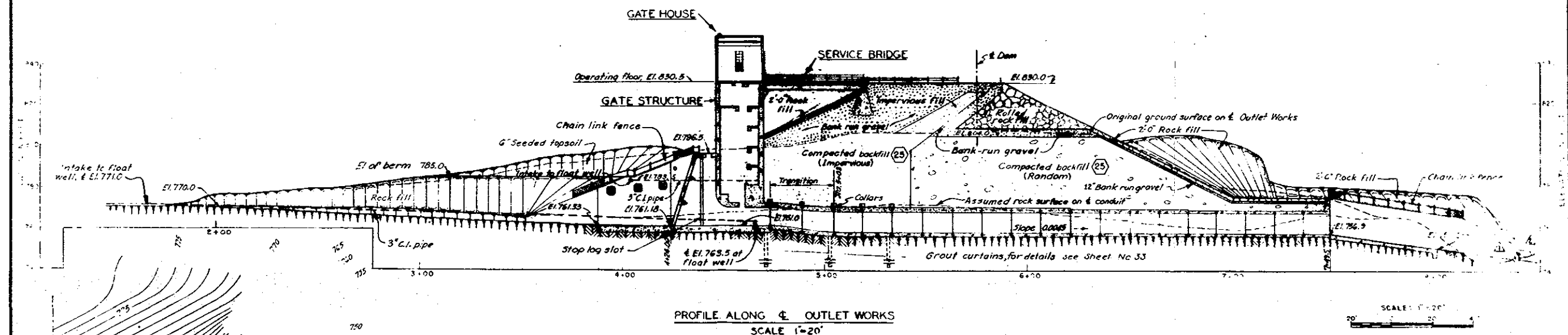
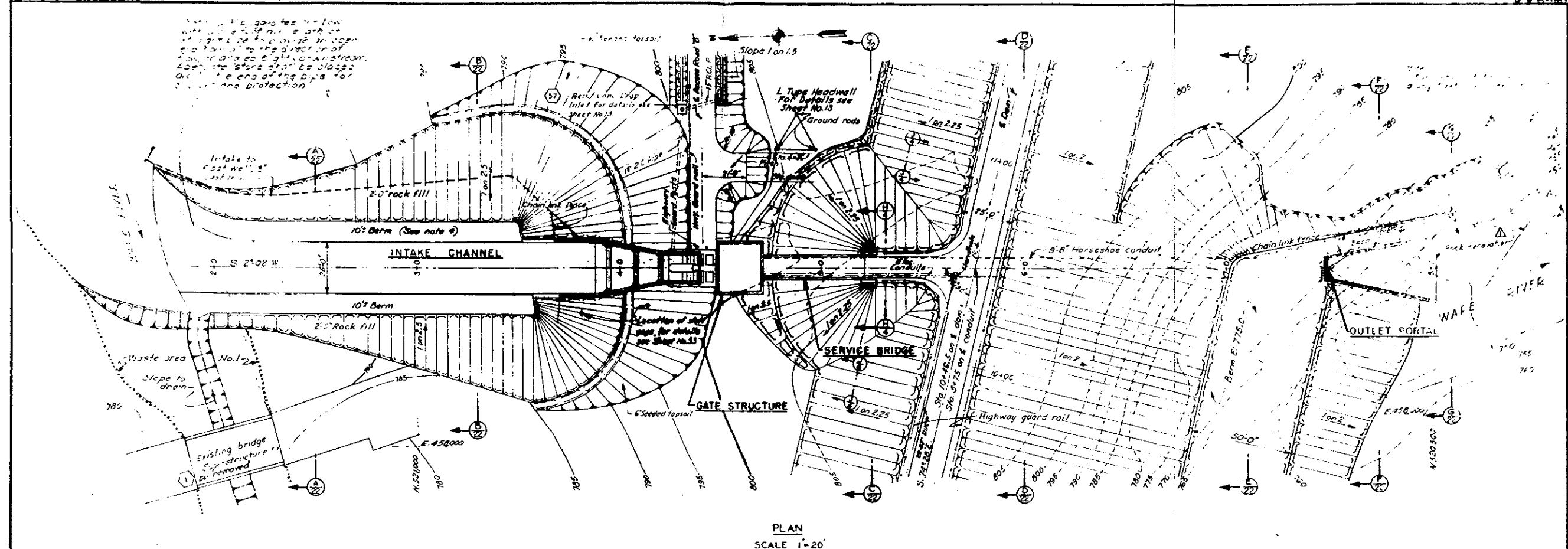
NOTES

Contour interval, 5 feet.
Elevations refer to Mean Sea Level Datum.
Grid system based on Mass. State Plane
Coordinates.
See extension of detail for details see Sheet
Nos. 45 and 46

Record Drawing
Contract No. CX-19-016-56-1354

7-21-60 Final Field Correction		BY
DESIGNED	DATE	DESCRIPTION
CORPS OF ENGINEERS U.S. ARMY OFFICE OF THE DIVISION ENGINEER NEW ENGLAND DIVISION, BOSTON, MASS.		
CONNECTICUT RIVER FLOOD CONTROL BARRE FALLS DAM SPILLWAY PLAN AND PROFILE WARE RIVER MASSACHUSETTS		
DESIGNED BY W.K.D.	DESIGNED BY K.H.W.	DATE FEB 1958
SCALE AS SHOWN		SHEET 14 OF 18
DRAWING NUMBER CT-1-3086		

SCALE 1" = 50'



LEGEND

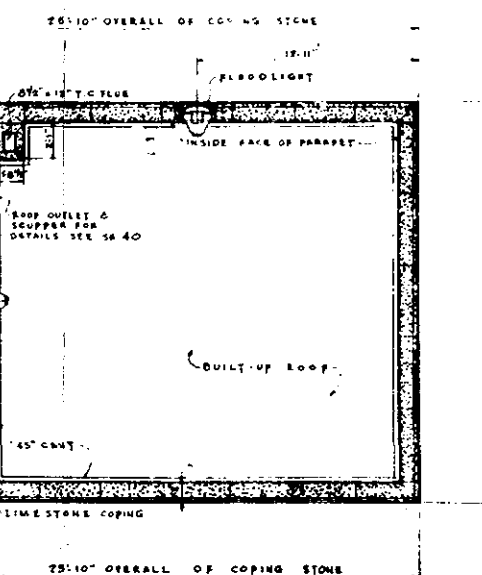
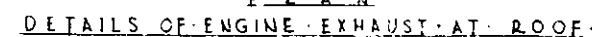
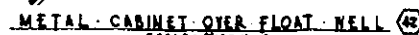
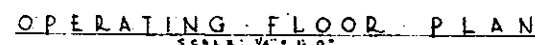
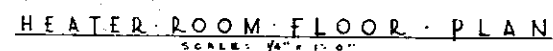
EXISTING CONTOURS
FINISHED CONTOURS

NOTES

Contour interval, 5 feet.
Elevations refer to Mean Sea Level Datum.
Grid system based on Mass State Plane Coordinates.
Width of rock berms to be varied in the field to obtain regularity of earth slopes with the width of berm, 5'.

Record Drawing
Contract No. 19-016-56-1354

6-10-6 Final field corrections	
2200152 Wall alignment changed	
2200152 Outlet wall layout revised	
REVISION	DATE
CORPS OF ENGINEERS U.S. ARMY OFFICE OF THE DISTRICT ENGINEER NEW ENGLAND DIVISION, BOSTON, MASS. CONNECTICUT RIVER FLOOD CONTROL BARRE FALLS DAM OUTLET WORKS WARE RIVER MASSACHUSETTS DATE FEB. 1966 DRAWING NUMBER GT-1-3093 SHEET 81 OF 78	



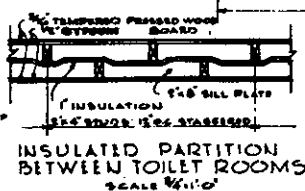
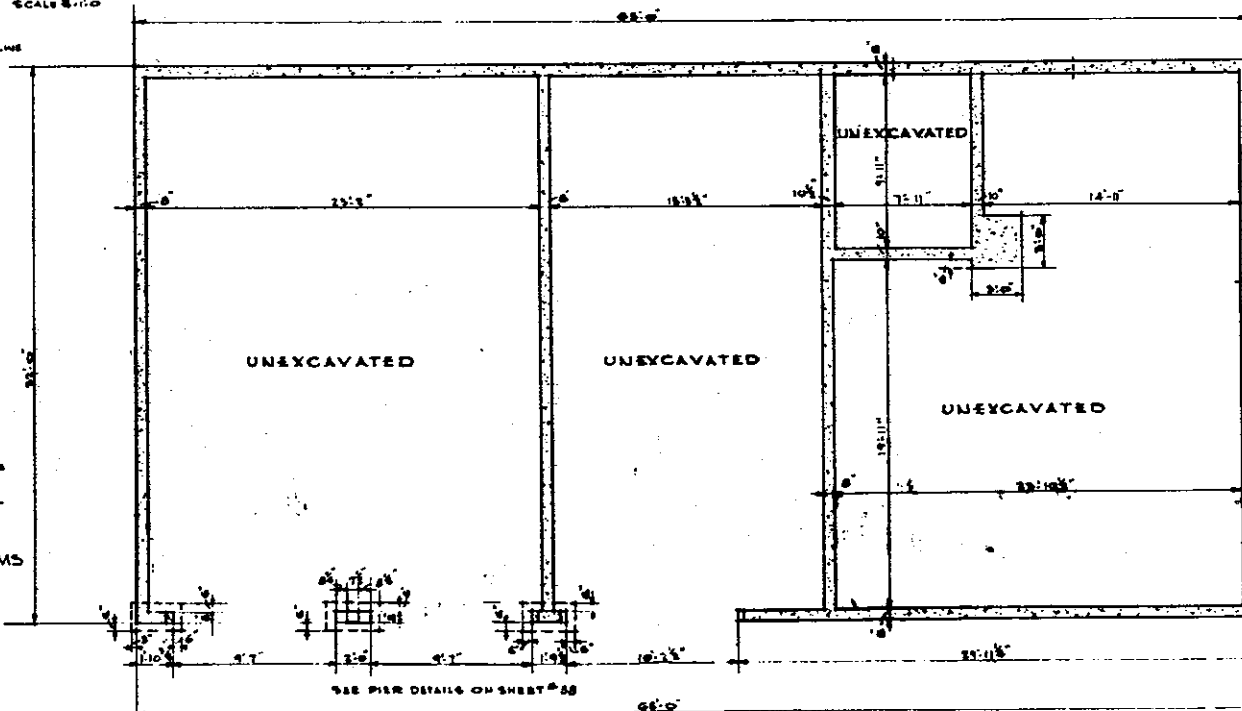
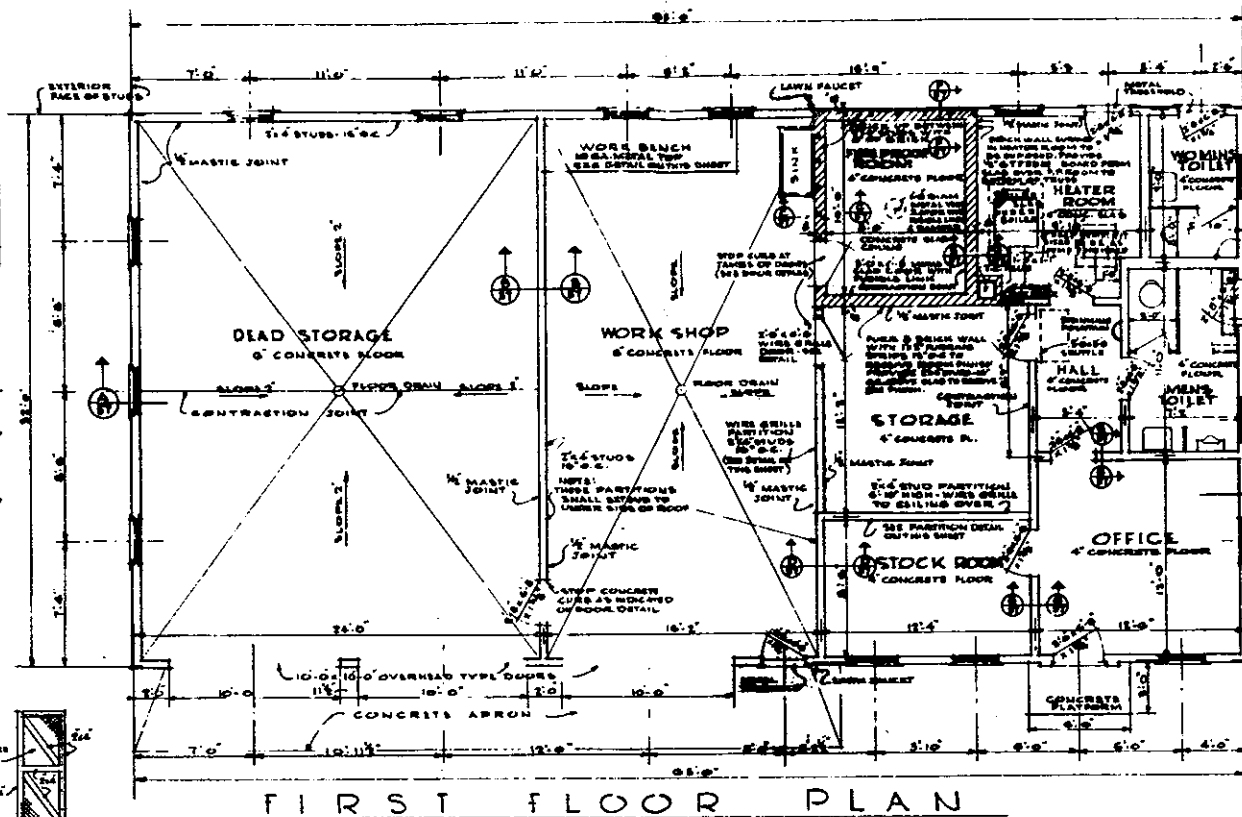
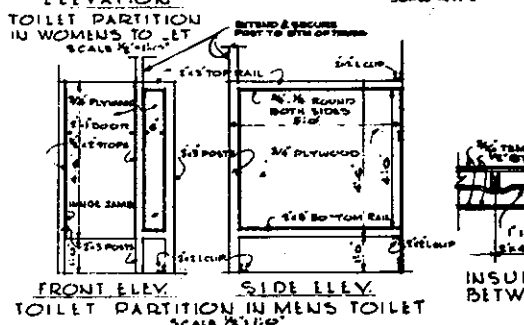
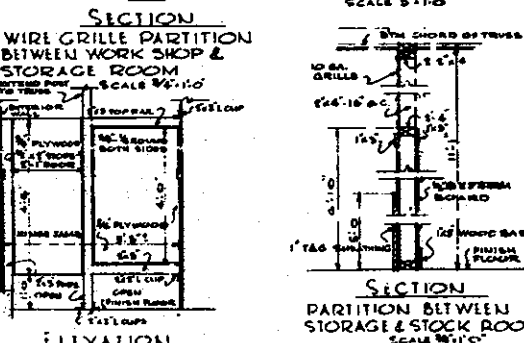
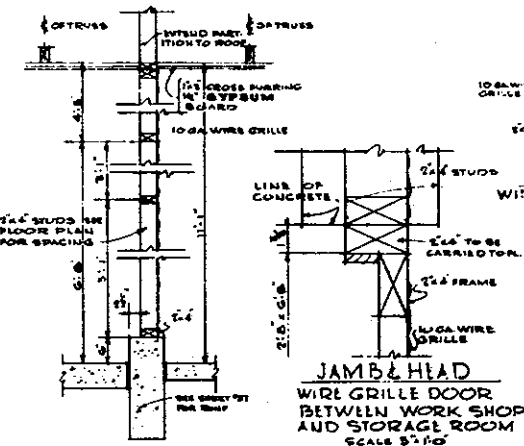
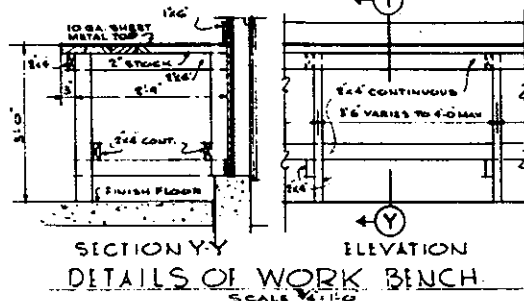
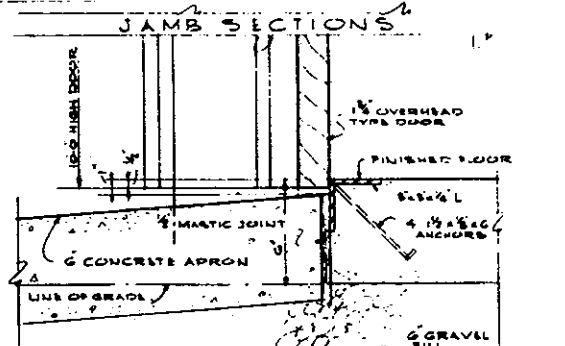
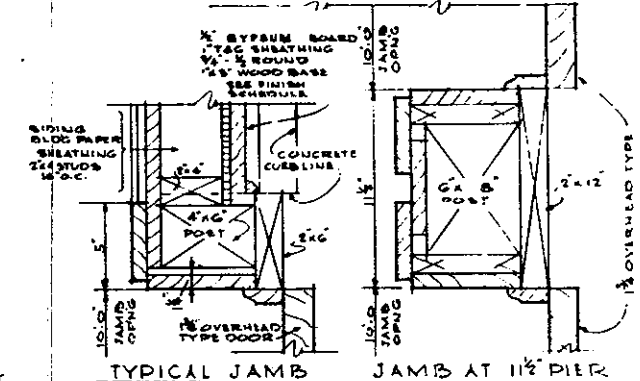
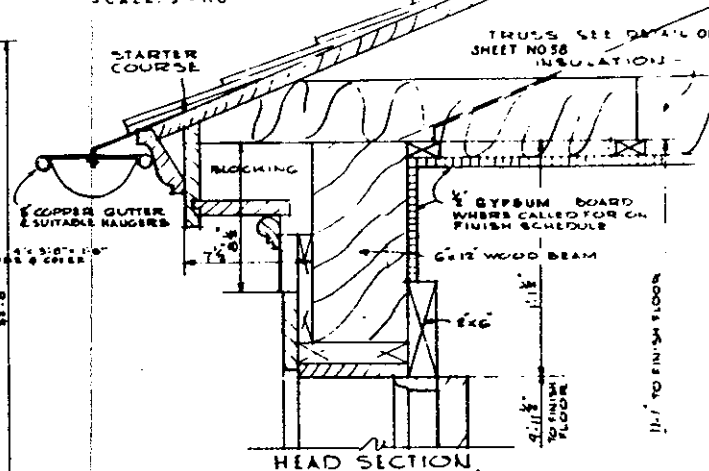
R O O F . P L A N

NOTES:
 1. THE GATE HOUSE SUPERSTRUCTURE WILL BE P.O. FOR UNDER ITEM #2 EXCEPT AS OTHERWISE INDICATED. FIGURES IN PARAGRAPHS INDICATE ITEM NUMBERS UNDER WHICH PAYMENT WILL BE MADE.
 2. ALL STRUCTURAL DIMENSIONS ARE FROM BOTTOM OF APPLICANT TO BOTTOM OF BRICK JOINT UNLESS OTHERWISE NOTED.
 3. ALL DIMENSIONS ARE BASED ON EXTENSIVE SURVEY OF THE SITE.
 4. WITH 50' JOINT.
 5. FOR ELECTRICAL CIRCUITS AND DIMENSIONS, SEE SHEET NO. 44-24-01.
 6. ELEVATIONS SHOWN TO MEAN SEA LEVEL DRYUM.

[illegible]

FINISH SCHEDULE						
ROOM	FLOOR	BASE	WAINSCOT	WALLS	CEILING	TRIM
OFFICE	CONCRETE	WOOD	WOOD	WOOD	WOOD	WOOD
HALL						
MEN'S TOILET						
WOMEN'S TOILET						
STOCK ROOM						
HEATER ROOM						
STORAGE						
WORK SHOP						
DEAD STORAGE						
WRECK ROOM						

* WALL BETWEEN DEAD STORAGE & WORK SHOP TO BE INSULATED & COVERED WITH 1" GYPSUM BOARD AND 4" HIGH WAINSCOT OF 1/2" TYPED REINFORCED WOOD. ALL OTHER WALL SURFACES IN DEAD STORAGE SPACE TO BE UNINSULATED EXPOSED STUDS.

LAKE PROFILE
SCALE 3"=1'-0"SILL SECTION
DETAILS AT OVERHEAD TYPE DOORS
SCALE 3/4"=1'-0"

REVISION	DATE	DESCRIPTION

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ORLEANS DIVISION
BOSTON MASS

DES BY: *[Signature]* CH BY: *[Signature]* CK BY: *[Signature]*
VD: *[Signature]*

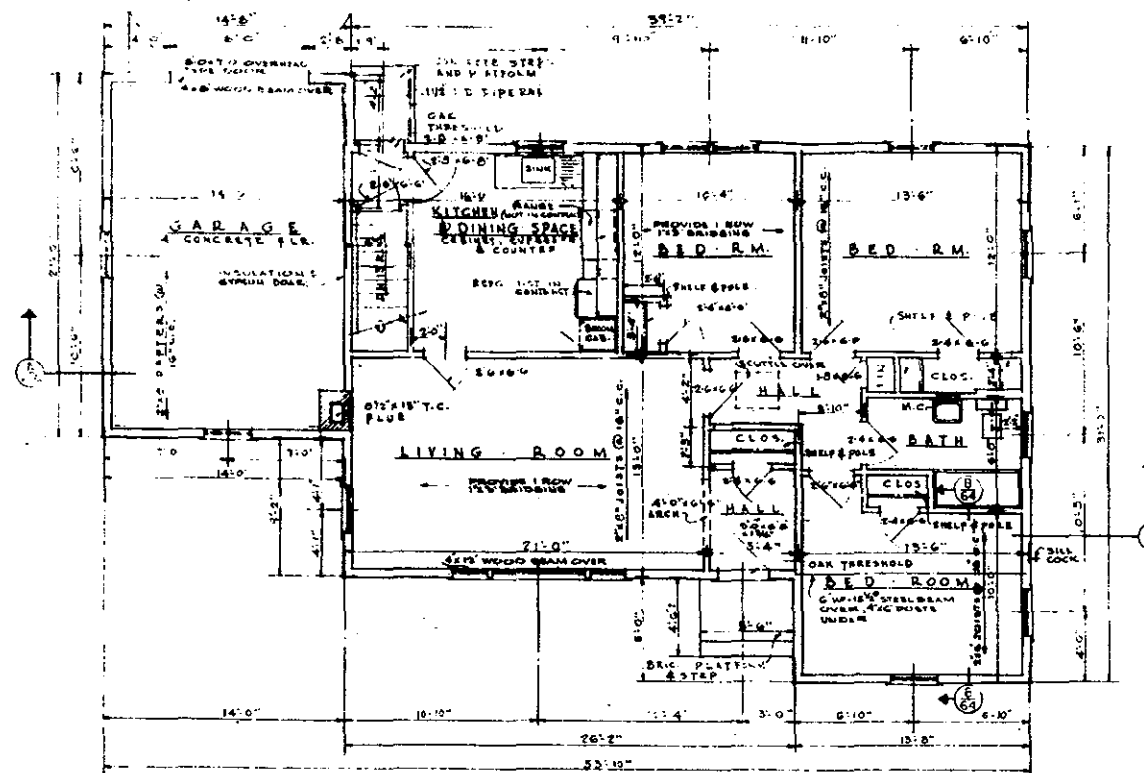
CONNECTICUT RIVER FLOOD CONTROL
BARRE FALLS DAM
UTILITY BUILDING
PLANS AND DETAILS
WARE RIVER MASSACHUSETTS
DATE: FEB 1956
SCALE AS SHOWN: SPEC. NO. ON LINE 9-10-11-12
DRAWING NO. 1-3127
SHEET 55 OF 78

GENERAL NOTES:

ALL EXTERIOR WINDOWS EXCEPT WINDOWS IN DEAD STORAGE SPACE TO BE PROVIDED WITH STORM SASH. ALL EXTERIOR WINDOWS EXCEPT WINDOWS IN DEAD STORAGE SPACE AND WORK SHOP TO BE PROVIDED WITH HALF SCREENS. ALL EXTERIOR DOORS, EXCEPT WATER RM & COMBINATION TYPE DOORS TO BE PROVIDED WITH SCREEN AND STORM DOORS OF COMBINATION TYPE. PROVIDE INSECT SCREENS FOR WINDOW Louvers. ALL ITEMS SHOWN ON THIS SHEET WILL BE PAID FOR UNDER ITEM NO. 32.

Record Drawing

Contract No. DA 19-010-56-1354



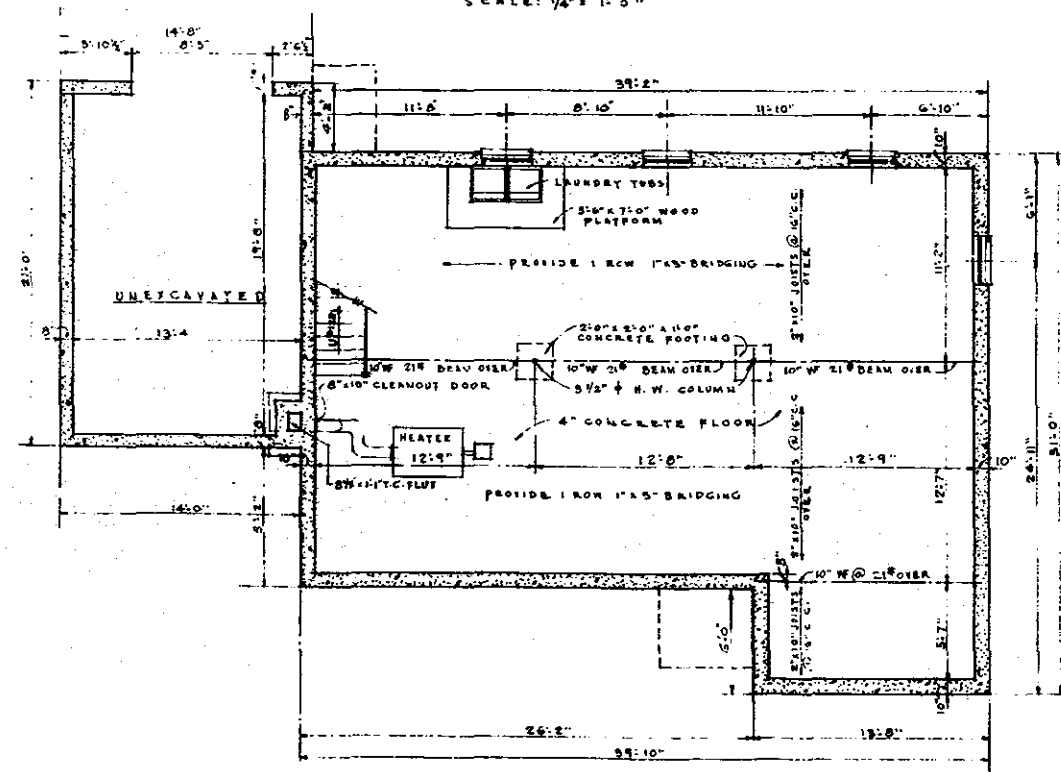
WINDOW SCHEDULE			
NUMBER	WIDTH	HEIGHT	REMARKS
A	2'-4"	4'-5"	DOUBLE HUNG
B	2'-4"	5'-11"	
C	2'-3"	4'-5"	
D	5'-0"	4'-5"	INSULATING GLASS UNIT
E	2'-4"	5'-5"	DOUBLE HUNG
F	2'-6"	5'-11"	

NOTE: STORM BASH TO BE PROVIDED WITH HORIZONTAL MUNTINS ONLY AND TO LINE WITH WINDOW MUNTINS.

ROOM FINISH SCHEDULE				
ROOM	WALLS	CEILING	FLOOR	TRIM
BASEMENT	CONCRETE	U.F. 1" HD	CONCRETE	
GARAGE	UNFINISHED			
KITCHEN				WOOD
DINING RM.			OAK	
BED ROOMS			FIR	
BATH			LINOLEUM	
HALLS			OAK	
CLOSETS			FIR	

NOTES:

PROVIDE ALL EXTERIOR DOOR OPENINGS WITH SCREEN AND STORM DOOR OF THE CONVENTIONAL TYPE. ALL WINDOWS, EXCEPT CEILING WINDOWS, TO HAVE INSIDE SCREENS AND STORM BASHES. PROVIDE 6"x6"x8" BEARING PLATES UNDER STEEL JOISTS. ALL ITEMS SHOWN ON THIS SHEET WILL BE SHOWN ON DRAWING NO. 56-1354.



SCALE: 1/4" = 1'-0"

REVISION	DATE	DESCRIPTION	BY
CORPS OF ENGINEERS, U. S. ARMY OFFICE OF THE DIVISION ENGINEER NEW ENGLAND DIVISION BOSTON, MASS.			
CONNECTICUT RIVER FLOOD CONTROL BARRE FALLS DAM OPERATORS QUARTERS FLOOR PLANS WARE RIVER MASSACHUSETTS DATE FEB. 1956			
DES. BY J. S. J. S.	CHK. BY J. S. J. S.	APPROVED [Signature] DIVISION ENGINEER	
DRAWING NUMBER CT-1-3134		SHEET 62 OF 78	